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ANALYSIS OF BLINDNESS AS A SYMPTOM OF HYSTERIA.

BY DR. THADDEUS HOYT AMES, NEW YORK,

ASSISTANT PHYSICIAN TO THE N. Y. NEUROLOGICAL INSTITUTE.

TWO patients at the Neurological Institute, whose cases were diagnosed as hysterical blindness by Dr. Ward A. Holden, oculist to the Institute, were quickly relieved of their blindness by psychoanalysis after one had been blind some weeks and another over two months. The first case was reported in full in the *Psychoanalytic Review*, vol. i., No. 1, Nov., 1913, under the title "Blindness as a Wish," an abstract of which case is given below. The second case is reported in full here.

Dr. Holden diagnosed both these cases as hysteria, because the blindness developed without there being any of the changes in the fundi, ocular apparatus, or nervous system which usually accompany blindness, and because no disease is known which will produce blindness without any demonstrable lesion in the body. Feigning was excluded in these cases by tests for tricking the patients into giving some evidence of vision, and because both patients were of a financial status which required them to work to make a living and they were not attempting to acquire any income as a compensation for the blindness.

Following the theories of some of the modern students of hysteria, that all the physical symptoms and manifestations of hysteria are the expression of purposive mental actions, and are assets to the patients, attempts were made in these cases

of blindness to discover if there were some person or situation which the individuals did not want to see, or if there were something in their mental lives that made vision undesirable; and by means of such information to understand just how such a symptom as blindness could be advantageous to the patients.

As the majority of people are not introspective enough to know the real motives and underlying factors of all their actions in normal everyday life, when they are perplexed by personal worries and hampered by symptoms of illness, they certainly should not be expected to tell instantly the keynote to the whole situation—they do not know it as such. And if they do recognize some bearing of their worries upon their symptoms there must be overcome the normal reluctance to admit such a state of affairs to the doctor and to themselves. Then, too, most people do not like to admit to themselves and to others that they have made the mistake of becoming ill because of their worries.

There were different methods used in these two cases to get the patients to admit that blindness was a refuge from their troubles: in one it was entirely by indirect questioning; in the other, by direct questioning. The one patient blocked all direct questions by flatly denying any troubles, so that my inquiries had to be confined to subjects about which the patient was willing to talk. Conversation was then kept up on items which he considered foreign to his symptoms until enough evidence was at hand to convince him that the worries to which he finally admitted were related to the blindness. The other patient frankly admitted her troubles when asked about them and thought they had a bearing on her blindness. As she thus simplified the whole procedure her case is presented first in this article.

Case of Miss M.:

A girl of twenty-six began in the autumn of 1913 to have headaches in the lower occipital and upper cervical regions; early in March, 1914, she lost her sight first in the right eye and then in the left until at the end of a week she was totally blind. Her general health was not impaired and she was able to do her work until she could see nothing at all. A doctor told her she would never recover the use of her eyes.

She was seen by Dr. Holden about two weeks after she

became totally blind and was admitted to the Third Division of the Neurological Institute. He found almost total blindness, there being perception of light only; the pupils round, equal, and slightly sluggish; and the eyeballs held in a fixed stare. In the general examination of the body no abnormalities were found. The urine and the blood Wassermann were negative.

She sat most of the time in a chair with her head bowed and supported by her hand; she seemed depressed and uninterested in anything. There was absence of emotion. When spoken to she did not brighten up, but continued the fixed stare of the eyes and the bowed position of the head, complained of being tired and having a heavy pressure in the occipital region extending down to the neck, and she wanted to leave the hospital because an operation was not advised. She co-operated only so far as to answer questions. At the outset, when she was asked which symptom she preferred to have removed if the doctors were able to remove one only and not both, she chose the removal of the headache. And when she was asked to choose between life without either the headache or the blindness, and death, she said she would rather have death.

Her home was on a farm where she had always lived, fourteen miles from the nearest town of any size. Her mother died when she was thirteen, and although there were eight children, the duties of caring for the three younger than herself devolved upon her, while the four older ones managed the house for the father. Within a few years the older ones all married or left home and she found herself in charge not only of the children but also of the farmhouse. And for ten years she did all the cooking, sweeping, scrubbing, and sewing for the household. If her father was pressed for help she drove teams about the two-hundred-acre farm. She usually gathered vegetables from the garden for the table, and to help her younger brother she picked stones from the fields. She never had a hired girl, and, she had never asked her father for a servant as she was not sure he could afford one.

A strong sense of duty about staying at home to attend to things developed after she had the entire responsibility of the house, and so since the age of fifteen she has not been away for a vacation. Her only trips were to neighbors' houses for afternoon calls and occasionally to stay to supper and spend the evening. The children were sent for short vacations, but she herself could not be spared to go, she thought. Three men had wanted to marry her, but all were refused since she already had a home and duties which could not be left, and, besides, she did not like any of the

three men. She said she was not sorry she had refused them.

The evenings were spent at home. Her father, aged fifty-five and alcoholic, always read books of history and biography, and their only conversation was about these books, for she read them, too, because having stopped school at fourteen she always wanted more of an education. But she wanted to talk about other things than those books. She wanted to take music lessons as she liked to sing and could play some of her own accompaniments on the piano; she wanted to dance, to go to the theatre, to see more of her friends—to do all the things she had read about. In recent years she had not even had her great childhood sport of riding horseback, because when the work was done either she or the horse was too tired. It was all work, work, work.

She wanted to talk to someone who was congenial and sympathetic. Her father was indifferent to her personal affairs and never discussed the management of the house, but left everything to her. If things went nicely he never gave praise nor encouragement, but if things went wrong he made sarcastic remarks, which hurt her and made her very sensitive.

In the summer of 1913, she became ill with some stomach or heart trouble, as she thinks, and had to stay in bed about three weeks. This was the first time she had ever had relief from the drudgery of the housework, but she felt too sick to realize that the rest from physical exertion was a benefit.

After she took up her work a heavy pressure developed in the back of her head and the upper part of her neck. She resented the indifference of her father. She would have cried if she could. She was lonely. She wanted to talk to someone who would understand her, and yet she was not sure she could talk about her feelings to anyone, since she had been brought up never to discuss them. She became tired of her whole existence and would have run away from home but for her sense of duty and because she could not bear to leave her little sister of fourteen who needed her and who loved her.

When she became so blind that she could no longer see to work, her father sometimes led her about the house so that she would not stumble, but he gave her no sympathetic words. She stayed in her room most of the time and found some comfort in being away from the others. Although she was inconvenienced a great deal in getting about, she was not at all in physical distress as she was the summer before when she had pain and had to stay in bed. She said she had not before thought of this comparison of the two sicknesses which in their way had brought about the only let-

up from work she had had all these years; the one had been a wretched let-up, but this blindness after all was not so very bad. She was now able to have rest and quiet, and things were done for her which had never been done before, and she was quite honest enough, she said after her attention was called to this peculiar way of considering her sickness, to admit that this existence of rest and being waited upon more than compensated for the blindness and the headache. She would not say at this stage whether she preferred the blindness to returning to the life at home.

She was then asked to consider the various means by which she could avoid the unpleasant things at home: first, by talking it over with her father and asking for what she wanted; second, by leaving home to go to work elsewhere; third, by committing suicide; and fourth, by being sick in some way. The first was of no use, she said; her father would not listen to her, he would not understand, he would say sarcastic things about her complaining; she was not sure he could afford a hired girl—it was out of the question to think she could straighten out matters by talking with him. The second way was also ruled out; she was needed at home by everyone, especially by the little sister; her sense of duty would never let her think of shirking or deserting, she said. The third way was absolutely never to be thought of under any circumstances. These first three propositions were dismissed very quickly as if they were already settled in her mind, but when the fourth way was presented she offered objections and tried to defend herself as if she were accused of feigning. It was only after she reassured herself that no one could bring on a sickness, especially blindness, just by wishing to avoid unpleasantness, that she was willing to admit that an illness which was not of her bringing about, could be and was actually a satisfactory way to dodge the work. No one could blame her for shirking during illness and she could conscientiously justify herself for not facing the issues as long as she was sick. In fact, sickness was the only way, she said, by which she could avoid drudgery.

If an illness, then, was the one way by which she could conscientiously escape from her difficulties, and if she *could* have the choice of any illness, she would choose one which would not keep her in bed or make her very uncomfortable. In fact, she said, the sickness which did come about answered all the requirements she needed; the blindness kept her from the heaviest work and yet allowed her to get out of doors, and the headache was at times so severe that others knew she was suffering, but it did not persistently distress the patient herself. Yes, she admitted sickness was the only refuge from drudgery she would choose; blindness was

to her the best form of a refuge because it was not disagreeable as an illness and also gave a conscientious excuse for not working; the relief already obtained more than compensated for the unpleasantness of the sickness; life without vision was more agreeable than life had been with it; and so she was glad she was blind; it was in accordance with her wish not to see that existence at home.

She was now asked if she thought that, by remaining blind indefinitely and thus escaping the drudgery of the housework, she would be doing her duty; and if she thought it honorable to remain blind when she knew that it was the blindness which brought the wished-for relief and that it was a desirable asset. Then for the first time she showed emotion. She had never intentionally shirked her duty, she said, and had never done anything dishonorable; if there was any possibility that she was now acting in this way, she wanted to do what was right to make amends; and if it was ever possible for her vision to improve or return, and if by recovering her eyesight she was fulfilling her duty, she wanted to see again.

An electric light was just over her chair and she was told to switch off the light. She recognized the darkness. Then she was told that she herself had the power to turn on her eyesight just as she had to switch on the electric light; that if she did not turn on both and stayed in darkness she would not be doing her duty, but that she must not turn on the light unless she intended to see at the same moment.

She said nothing. She did not let go of the lamp or the button, but she did not turn on the light. After nearly a minute's suspense she said she was ready, but she was again directed not to turn the button unless she intended to see. She repeated she was ready.

She turned on the light. A look of interested curiosity came over her face as she gazed at her hands which still held the light. "Why, I can see my hands." Then she turned around and said, "Why, I can see everything."

Examination the following day by Dr. Holden showed vision to be $\frac{20}{20}$ in each eye and Jaeger type No. 1 was read at twelve inches.

The next case was managed differently. The following account is an abstract from the *Pyschoanalytic Review.*

A healthy factory worker, aged 39, became totally blind overnight, and after ten weeks, during which time no other symptoms developed, he was admitted by Dr. Pearce Bailey to the Third Division of the Neurological Institute in Octo-

ber, 1912. Absolutely no physical abnormality was found and Dr. Holden diagnosed his condition as hysteria.

He was unwilling to talk about himself and denied that he had any personal affairs that were troubling him. As he had casually volunteered the information that he always had dreams and as he was willing to talk about them, his dreams were made the subject of conversation. And, shortly, he found that the stories told by the dreams were analogous to certain incidents in his life which he had never told anyone. He had noticed himself that the character of a certain repeated dream changed abruptly with the onset of his blindness. Then, because he was convinced that the blindness was connected with the change in the repeated dream, and all the dreams were analogous to certain personal secrets, he decided to tell his whole story. He then quickly realized and admitted that his blindness had helped him to accomplish comfortably what he had not tried to do in any other way and that he was glad he did not have to see.

The following dreams were the means by which the patient came to understand the course of events. The first one is:

He went into a drug store and became engaged in an argument with the druggist, getting so angry that he threatened the druggist with a lawsuit. As a matter of fact, he said, no such incidents had ever occurred. He had often thought of going to a drug store to buy some poison to end his life; because his home life was unhappy. Six months after his marriage he found that he no longer loved his wife. During the following fourteen and a half years he just endured her presence, always with a never-relieved, pent-up strain. So he considered poison as his solution of his difficulties.

The appearance and actions of the druggist of the dream suggested to him not any special druggist, but the man who, as owner of the factory where he worked, was responsible for the recent loss of the position he had held for fourteen years.

He had never had an open quarrel and had not been involved in a lawsuit and had not even threatened anyone with one. But on considering what person could become involved in a suit, or what person there was from whom any gain in a personal way could be obtained through a suit, he said he had sometimes thought of the relief he might get if he had some grounds against his wife so that he could file a bill for divorce and be freed from her "torments." He thought a divorce would free him from his troubles just as poison would.

If we now look at this dream with the idea of finding the wish therein contained, as Freud maintains there is in every

dream, we see in its various parts, as the patient very readily saw, wishes which he had had, but had not admitted or carried out. His waking wishes had been to go to a drug store for poison with which to end his troubles; his dream took place in a drug store. The dream gave him the opportunity of becoming angry and threatening someone with a lawsuit, an act which if directed and carried out against his wife would free him just as the poison would. The dream contained a combination of the two solutions for his troubles which he had thought out for himself, poison and divorce, and gave the more prominence to the threat of the lawsuit, indicating, as the patient said, that the lawsuit was the more desirable solution of his troubles.

The next dream, one he had after coming to the Neurological Institute, is as follows:

He starts an automobile going, but after a short distance it stops and drops to pieces. He tries to put the pieces together.

Nothing like this had ever happened to him; he had never started, driven, or put together an automobile. His only acquaintance who had a car was this same factory owner, his former employer, who had promised but had never given him a ride. When he lost his old position he had to drop down to smaller wages in the other factory. With this decrease in pay, his plans for the payment of his recently built house were seriously interfered with. He feared he might lose the house.

His greatest concern was not, however, his financial stress. He had built a new house, believing that if he and his wife were to continue to live together, a new and common interest might bring them more contentment. She seemed, however, to take no interest in the house or in the payment for it, and continued in her unjust fault-finding. He was completely discouraged, and now he was blind.

After this recital of his affairs, he saw instantly that what he had been telling was another version of the story of his dream. The actual details of the dream had not occurred, he said, but things very similar had taken place, when all the plans for his financial and domestic schemes fell through. He said he was just at the stage in his real life that he was in the dream when the automobile dropped to pieces, and he did not know what to do until he got back his eyesight.

If Freud and Jung had done nothing more than to demonstrate that in every dream there is a wish, they would have contributed much. In this short dream about a man starting something going, and his attempting to fix it up when it dropped to pieces, no other wish can possibly be conceived than that he is trying to put together something that once existed.

The next dream is the most significant for two reasons: it brought forth material not previously ascertainable, and by means of which the blindness was removed; and it was a repeated dream, one which came six or eight times before the blindness, and after it, fully fifteen times, changing in its termination from the moment of the onset of the symptom.

At first the dream was as follows:

He got into a fist fight, but as he tried to strike, his fist fell short and he hit nothing. He awakened with a feeling of defeat.

He had never had any actual fights. The only provocations he had had were with his wife and this factory owner, and he had always endured their talk and actions without retaliating. He had neither the courage nor the desire to fight them. It was his wish and intention to be defeated in such affairs.

After the onset of blindness came this change:

He got into the same fight and when he struck, his fists always hit so hard that he came out victorious. He awakened with a distinct feeling of victory. The man commented instantly about the sudden change in the dream at the very onset of his blindness, and volunteered that if there was any significance in dreams at all, there must be some special reason for a change in a dream which came so repeatedly; and moreover that if there was a special reason for such a change and this change came at the onset of his blindness, he was convinced that his blindness had something to do with that reason.

Then he reluctantly told of the events of that summer. He had had an offer of a good position in the West and, after several weeks' deliberation, he made up his mind definitely to take his three children and go away without the knowledge of his wife, and never see her again. This definite decision startled him. He had for the first time taken a step against his wife. Perturbed, he finished his work that day, and he slept well. But he woke the next morning blind. He was of course unable to go away, but he no longer saw his wife; it was now not necessary for him to go away.

For the first few days he was terrified. Later, in spite of the discomforts of being blind, he found a very definite comfort and almost a feeling of secret joy in not being able to see his wife. Never before in these fourteen years had he had this feeling of comfort when she was in his presence. This was a victory, he said, which was very definite to him, so definite, in fact, that he was sure that this was the feeling of victory he had in the dreams, which caused the dream termination to change from defeat to victory.

Shortly before his entrance to the Institute, he believed as he now thought of it, that his wife had become a little more kind to him and seemed to antagonize him less than she did before he was blind, and even less than she did in the first weeks of the blindness. His blindness had not only been a source of satisfaction and gratification to him in preventing him from seeing his wife, but it had brought about a change in the attitudes of both.

On this realization that his blindness was the expression of his desire not to see his wife, and that by being blind he gratified his desire and had also effected a change in her attitude toward him, the idea occurred to him that if all he wished was not to see her, he could find less inconvenient ways than by remaining blind. He, too, turned on his own eyesight along with the electric light. Instantly the blindness disappeared.

He picked up a newspaper. He read it. A day later he wrote a letter to his wife saying he was coming home. Furthermore, he said, he went willingly.

These two cases differ in certain respects and have certain points in common. The girl was quite ready to unburden herself of her worries, and answered questions so frankly and freely that her relief from blindness came about in less than a total of three hours of time actually spent in interviewing her. She had no dreams at all. The man, however, was unwilling to talk and so about nine hours were spent during the period of four days before the result was accomplished. The onset of the girl's blindness was slow and was preceded by headaches, whereas that in the man was sudden and without any previous symptom.

The girl showed at the first examination by Dr. Holden slightly sluggish pupils, and she maintained a fixed position of the eyeballs, so that the diagnosis was complicated, but Dr. Holden did not find reasons for calling her case other than hysteria. The examination after the recovery of her eyesight showed the pupils reacting promptly to light, and freely moving eyeballs. The man did not present such a problem for diagnosis.

The symptoms in both cases were confined to the ocular apparatus, except for the headache, and no other symptoms were present at any time in any other part of the body. Neither of the patients seemed very much distressed over the

prospect of being permanently blind; both seemed rather resigned to the condition, and neither begged on admission to the hospital for a single thing to be done for their recovery. Both patients admitted that the relief from their troubles more than compensated them for being blind; both had something undesirable to see at home; both had wanted to run away from their troubles to avoid seeing them; and both found blindness an asset. They recovered normal vision instantly when they were placed in a position where they themselves had to choose between blindness and vision. Both turned on their eyesight along with the electric light. Both declared and manifested a great general relief of tension with the return of sight; in a day their demeanor was entirely changed, and they seemed interested in others about them, and their facial expression was active. The pressure in the girl's head disappeared altogether. Both began making plans for the betterment of their problems at home and intimated that they too might have some faults which had aggravated the previous state of affairs.

Although the blindness is removed in these cases it cannot be said that the prognosis is absolutely good. Whenever any hysterical case returns home and is out of the control of the doctor, the same aggravating causes may come up again and the patient may be unable to cope with them. The prognosis in any case of hysteria is quite dependent on the life of the patient after the symptoms are removed. But it is thought that patients who reach an understanding of the underlying factors and the real motive of the symptoms are those who are least liable to have a return of their symptoms.

Thanks are hereby expressed to Dr. Bailey and to Dr. Holden for permission to publish a report of their cases and for their suggestions for the preparation of this article.

FURTHER EXPERIENCE WITH THE WRITER'S METHOD OF SHORTENING OCULAR MUSCLES WITHOUT EMPLOYING SUTURES UNDER TENSION.

By Major R. P. O'CONNOR, U. S. Army Medical Corps.

(With four illustrations in the text.)

THE description of this method of shortening and advancing ocular muscles was first published in the *Journal of the American Medical Association* of March 2, 1912.

At that time only one case was reported and that not very conclusive. In this paper I am able to report four additional operations on three cases which I believe are conclusive and will bear out my contentions.

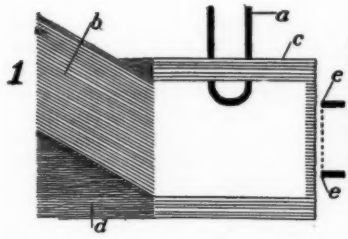
For the benefit of those who may not have seen that description I will quote from it, with such alterations and additions as may seem necessary, before describing my cases.

I was led to attempt to devise new methods of shortening and advancing ocular muscles, first, by the great variety of such methods, indicating that no one is entirely satisfactory, and second, by the constant repetition of the necessity for marked over-correction to allow for subsequent slippage.

The great defect in all methods of which I have seen descriptions is that the sutures are under the elastic pull of the muscles, thus violating one of the important principles of surgery in regard to suturing. The problem then is to devise methods in which either (1) no suture—in the sense of being employed to hold two parts together—is used, or in which (2)

if such sutures are used, they are so supported as to be under no tension. I believe that the following technic solves these two problems. I have varied it in a couple of minor particulars since first described and have found that especial emphasis must be laid on several points to make the principles of the method clear.

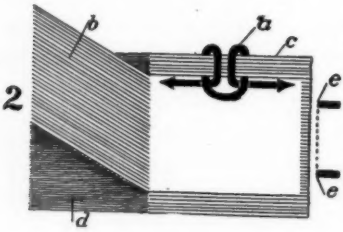
The steps in the operation are as follows: (1) the entire tendinous portion of the muscle must be exposed by any method preferred; it must, however, be fully in view during the operation; (2) a strip of tendon is separated from each margin of the tendon, by blunt separation, from the sclera to the muscular portion of the muscle. The flat iris repositor does very well or the small blunt hook. The width of this strip may be varied—the wider the greater the effect, and vice versa. One millimeter is a good average although less affords plenty of strength; (3) the central portion is now cut away close to the sclera and laid back out of the way; (4) a double-armed thread is now passed through the point of insertion so that the loop is beneath and the two ends laid across the cornea out of the way. (Instead of this method this portion of the operation can be done by the tuck method if the operator prefers); (5) the cat-gut shortening strand is now passed by carrying its center (Fig. 1) under one of the marginal strips and bringing



(*a*) Cat-gut strand.
(*b*) Reflected central portion of tendon.
(*c*) Marginal strip of tendon.
(*d*) Muscular portion.
(*e*) Suture passing through scleral insertion which will hold central section of tendon.

the two ends through the loop so formed over the strip, thus making a double loop about the tendon strip. The loop must now be drawn fairly snug and placed exactly in the center of the tendinous strip, because if not so placed there may not be sufficient tendon available to carry out the next step—(that is, making the tendon loop itself about the gut). Now the

ends are so arranged (Fig. 2) that they do not cross but do



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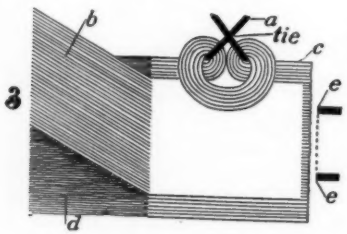
Shows how the ends of cat-gut are brought through the loop and separated; if they are permitted to cross each other, on straightening the double loop will *not* form in the tendon. Other letters same as Figure 1.

come out from their respective loops (this is important). Before making the cat-gut loop it must be made flexible by soaking in water, but not so long as to produce swelling. I use Lukens 20-day and have no marked reactions. I have heard from one operator that chromic gut caused an excessive reaction that lasted a long time; (6) everything now being ready the two ends of the cat-gut are pulled apart thus straightening it and transferring the double loop to the tendon. Not much tension is required, and if this loop does not appear the preceding steps have not been carried out properly; (7) the two loops must now be slid into *close* contact by means of pinching with a pair of iris forceps. (Fig. 3.) This is the



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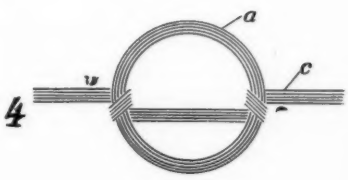
Shows the double loop in the tendon at right angle to the loop and in the same plane as that of the cat-gut circle after being tied. Of course there is no attempt at proportion as it is a diagrammatic sketch only.

most important step for it takes the slack out of the tendon which, if allowed to remain, will defeat the object of the operation by permitting the tendon to practically straighten itself when the gut is tied to act as a retention knot; (8) while the tendon loops are held in contact by the iris forceps the gut is tied, but not so tightly as to produce constriction of the tendon. As will be noted in the description of my cases I have varied

this step at times by using two strands of gut, one a No. 00 to tie as the retaining knot, the larger to act as the shortener which is cut off short. This makes a much smaller bunch; (9) the other strand is now shortened in exactly the same way; (10) the central section is now laid forward, the needles of the double-armed thread passed through it at a point as far back as possible without producing tension on this suture. If the operator desires he can advance the end of this central section forward to a new attachment between the old one and the cornea. The object of the operation is now accomplished—that is, the production of a shortening in the inelastic tendon which will remain until the gut absorbs, and which serves to splint the suture holding the central section and which affords ample time for firm union to take place at that point.

If the principle is grasped it will be seen that there is no constriction of the tendinous strips—just the reverse being the case—these strips surrounding and constricting the catgut (Fig. 4), therefore they have only to stand the strain of their own pull.



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This is a magnified view of the preceding but at right angle to the plane of the gut. It shows the course of the tendon strip around the gut. It makes clear the fact that there is no constriction of the tendon, and also shows the importance of not having any slack in the gut, for it would allow the pull of the tendon to loop the gut, and so return to its original position—thus defeating the object of the operation.

The following experiments were made to determine what amount of strain the strands would probably stand before rupture. A pig's head was secured and the operations done on one of the eye muscles. The tendon was exposed and only one marginal strand tested. After it was properly shortened, from it was first suspended a pound, then a two-pound weight, then a hook was put under and the whole head lifted from the table. These having no effect on the point of shortening, the hook was replaced and pulled on until rupture occurred, which proved to be at the junction of the tendinous portion with the

muscular portion while the point of shortening was perfectly secure. When one considers that the strength of the internus has been determined by Howe to equal about a half to one ounce, it is clearly seen that by no possible chance can the normal action of the shortened muscle affect the point of shortening, especially in the absence of any constriction to produce cutting.

Practically this point is proven by the above tests, as well as by the fact that in none of my five operations was there any diminution in the effect until enough time had elapsed to permit of absorption of the gut. This later diminution in the effect cannot be used as an argument against my method, as I only claim that it will prevent the immediate slipping that so often occurs and that without subjecting the patient to several days' confinement in bed with both eyes bandaged.

The one great advantage of the method is that it does give a definite and measurable amount of shortening in the tendinous inelastic portion of the muscle. This, of course, does not mean that the whole muscle is shortened by the same amount, but it does give something more definite to go upon, and in time we may learn how much to allow for the stretch of the muscular portion.

In this connection it may be well to remind that but little actual shortening is necessary if permanent, and that by my method as much as 6.5*mm* shortening can be secured by using gut 1*mm* in diameter, which would mean about 33° of arc if permanent. As this much is never secured even by the most extensive advancements by the ordinary means, it necessarily follows that they all slip. It is the purpose of this method to prevent this primary slipping and thus give a definite point from which to work.

It will be seen that the shortening by my method is equal to twice the circumference of the gut used and that therefore the shortening can be varied in this way.

I would therefore sum up the advantages of the method as follows: (1) it is easier to perform than the other types of advancement; (2) there is a definite shortening in one portion of the entire muscle length—the inelastic tendon; (3) there is an attachment to the globe which is under no tension, even when the muscle is in action, the marginal strands taking all

such strain; (4) slipping during the first few days is eliminated; (5) no confinement is necessary, and it can be done as an office operation as proven by my cases; (6) it is probable that the final stretch of the scar tissue will be less, as the point of attachment is free from tension for so long; (7) and for all these reasons it is also probable that much less over-correction will be necessary; (8) there are two means of varying the amount of effect—by the width of the tendon strip and by the diameter of the gut employed.

In the following account of my cases I wish to call attention to the fact that the operation was severely tested purposely in the following particulars: (1) no restriction to bed; (2) only the operated eye was bandaged and that only for purposes of protection; (3) there were no tenotomies on opponent muscles to give aid; and, (4) that with all these severe tests there was no immediate loss of effect from slipping or other cause, such loss as did occur not showing for a considerable time after the operation.

CASE 1.—M. G., a Mexican laborer, who was operated as a test case merely for cosmetic purposes, as the deviating eye was blind, the result of injury incurred some years ago. The deviation was between 10 and 15 degrees of arc measured on the perimeter. The case was especially suitable for test purposes because the practicability of the technic and the immediate effect could be determined without any danger to the eye or to the vision. Up to the hour of the operation he was engaged in painting the ceiling of the operating room. The operation was done under local anæsthesia, a bandage was applied only to the operated eye, and he was allowed to go home. The next day he resumed his work on the ceiling and continued it till he left the fort five days later. The second night after operation he went on a drunk and raised such a disturbance that it became necessary to confine him in the guard-house. In spite of all these severe conditions there was no slipping at the seat of attachment, which was all the encouragement that I needed, for I could not imagine any harder tests being given. This case has been seen recently and the cosmetic effect is still satisfactory to him although there has been some diminution in the effect.

CASE 2.—W. H. B., one of concomitant exotropia. First examination showed the following condition: Vision

$\frac{20}{20}$ each eye, with a low degree of hyperopia in each eye; right hyperphoria 1°; no cyclophoria; exotropia 15° by the perimeter but fused flames with prism 19° base out —this being due to false projection, the result of a tenotomy done on the left externus about a year before. Operation on the left internus was done on February 19, 1913. After the operation only the operated eye was bandaged, his actions were in no way restricted, and he was returned to duty on February 28th. Up to the above date his eye showed no deviation to the cover test, but convergence for objects within the reading distance was defective. However, at this operation, it was not desired to secure more than half the final correction, and upon his departure he was told that another operation would be necessary in several months, or after this eye had settled down to its permanent position. He returned for the second operation on August 10, 1913, the condition at this date being as follows: false projection still apparent, also exotropia except upon effort when the eyes could be brought to the parallel position, convergence poor, vertical orthophoria, no cyclophoria, perimeter showed about 5 to 10 degrees of deviation but the large disk in its center interfered with proper placing of the observer's eye, therefore this measurement is *not* accurate. He stated that since the first operation it has been easier for him to look toward the right, probably because the left internus became stronger than the right. The second operation was done on August 11, 1913, being an advancement of the right internus. The technic was varied a little in that a No. 0 Lukens 20-day gut was used with a No. 3 of the same make, the smaller being tied to retain the tendon loops and the larger being cut off. This reduced the size of the knot very much. The immediate result was a marked convergence. On August 18th, seven days after the operation, there was an esophoria of 7°, this being brought out by the red glass without which there was no diplopia. Upon the removal of the red glass from before one eye, he stated most positively that the two white lights rapidly approached each other and fused into one, thus proving the presence of binocular single vision. In addition, he states that he can distinctly "feel" that he sees objects singly with both eyes. It will be noticed that after this operation his diplopia became homonymous, the false projection having disappeared.

On August 30th, the date he left the hospital, his condition was as follows: convergence to tip of nose, binocular single vision, no deviation by cover or perimeter, rotations normal in every direction, and external appearance normal. The explanation for this man's prolonged stay in the hospital

on each operation is that he was sent to this hospital from a border station for treatment, and could not be sent out till he was ready to perform full duty.

CASE 3.—G. E. M., internal squint as long as he can remember. Condition on first examination: Vision O. D. $\frac{20}{16}+$ —this being the fixing eye; O. S. $\frac{20}{30}-1$. Muscles—right hyperphoria, 4°; left cataphoria, 1°; esotropia, 22° each eye—no cyclophoria—rotations normal inwardly—outwardly 50° with right eye and 40° with left. Refraction under atropin:

O. D. + S. 1.50 with + cyl., .25 axis 90 = $\frac{20}{20}+$
O. S. + S. 1.75 with + cyl., .50 axis 105 = $\frac{20}{30}+$

Eye grounds and media normal.

Left externus advanced on March 1, 1913, the technic being the same as the second operation on Case 2. March 4th there was 5° of esophoria which had increased on March 9th to 7°. Evidently not enough tendon had been taken up to make a full correction, but this was not desired as I wanted but half in each eye. On March 18th the rotations were 50° outward in each eye, the left having gained 10°, bringing it up to that of the right eye. Left hospital on this date, the eyes being almost straight to outward appearances especially when wearing his glasses. He was directed to wear them all the time and to return in several months as another operation would certainly be necessary.

He was not seen again till September 7th. The condition had changed but little although there was distinct resetting outwards to the cover test. He had diplopia and false projection so that an accurate measurement with the phorometer could not be secured, as my perimeter does not permit of accurate measurements near the 0 point on account of a large disk. With his glasses he had binocular single vision up to 17 inches from his eyes. At greater distances he had diplopia which, however, did not bother him very much. I learned that he had not followed my instructions in regard to wearing the glasses constantly.

He refused absolutely to permit operation on the other eye, being satisfied with the cosmetic result from the first, although informed that the result was incomplete and could easily be made complete by another operation. The effect from my standpoint was all that could be desired, but nevertheless I am disappointed in not being able to report it as a complete case.

CASE 4.—M. S., age 14. Has had an alternating esotropia since babyhood. This case I saw first in 1907, at

which time she had 15° squint with 2.75 diopters hyperopia in each eye. Stereoscopic tests at that time showed the existence of binocular fusion. On May 29, 1913, the condition was exactly the same, there being vertical orthophoria and no cyclophoria.

Advancement as in Case 3, on June 13th, under ether anæsthesia because of an extremely nervous temper. Upon recovery from the anæsthetic she was taken twenty miles to her home in an automobile, wearing over the operated eye only a protective patch. At the operation only a very narrow band of tendon was looped as a complete result was not desired in the one eye. She was not even seen again till July 11th, when I learned that there had been no pain whatever at any time after the operation. At this date she presented the following condition: esophoria 4° with red glass, but fusion upon its removal. On August 7th, esophoria 1° with red glass and fusion of even the red and white images. No hyperphoria or cyclophoria. One cat-gut knot still evident but causes no inconvenience and the eye is practically white. The result in this case was complete from the one operation, being more than was expected or even desired. I have seen her a number of times since, casually, and there has been no loss in the effect that is apparent to the naked eye.

A SUBJECTIVE EXAMINATION OF THE PUPILLARY REFLEXES.

DR. HARRY S. GRADLE, CHICAGO.

(With one illustration in the text.)

I DO not intend to discuss the value of the pupillary reflexes nor their translation, but merely present a subjective method of examination. This test is not entirely original, for the basic principle was told to me by Dr. Kraupa of the Elschnig Clinic. He did not know the origin nor have I been able to find any references to it in the literature. I have merely worked out the details and wish to present it as a diagnostic aid.

With a rigid pupil, as an Argyll-Robertson pupil, it is sometimes very difficult to determine whether any contraction exists or not. The test I am about to describe can be used, however, only in patients of a fair degree of intelligence. One eye is closed and immediately before the other is held a bi-concave lens of either 30 or 40 diopters strength. A light of not more than eight candle-power, held ten to fifteen feet in front of the patient, is then switched on. Through the lens, the patient sees a circular disk of light which immediately contracts, becoming smaller in size. This disk is merely the image of the divergent rays passing through the lens and bounded by the pupillary edge

of the iris. The greater the contraction of the pupil, the smaller becomes the disk.

To test the consensual pupillary reaction, the same lens and the same light are used, but in front of the other eye is placed a ground glass blank. The eye under this blank is covered with the hand and the light turned on. As soon as the maximum pupillary contraction has taken place, the hand is removed and the patient sees through the lens the disk of light contract. As some light has been entering the eye, the contraction is less than occurs in the first test, but sufficient to be noticed.

SOME CASES OF STAPHYLOCOCCIC INFECTION OF THE EYE TREATED BY IMMUNO-THERAPY

By Dr. R. L. CROCKETT, Oneida, N. Y.

I HAVE several cases to report which illustrate to me a very interesting phase of the treatment of infection of the eye by immunization.

Mr. B. came to see me the first of January, 1913, with an eye which had been injured by a chip of wood and which had developed a panophthalmitis in consequence. The eye was very much swollen and full of pus. Fearing to enucleate it on account of the danger of meningitis, I removed the cornea, iris, and ciliary body with the scissors, and allowed the sloughing interior of the eyeball to separate, which it did in a few days. After about two weeks the patient was sent home with instructions to report in a week.

At this time the slough had entirely separated and the stump was doing nicely. At the time of the operation I made a culture from the pus and found a pure culture of staph. pyogenes alb. Thinking that this would be a good source for stock vaccine of this organism, I made up a quantity.

The patient did not return until a month had passed, and then he came complaining of the left eye being very sore and the vision poor.

On examination I found the iris muddy and the pupil contracted with many posterior synechiæ which did not yield easily to atropin. The circumcorneal injection was marked, and there was exudate in the lower part of the anterior chamber. The eyeball was very soft and tender.

I prescribed atropin 2% with dionin 10%—two drops every four hours for local treatment, and administered a dose of about 1000 million of the killed staphylococci which I had prepared.

He returned in a week with the pain all gone and with

very little ciliary congestion. The iris did not dilate very well and was still discolored. The exudate had mostly disappeared from the anterior chamber.

He received another 1000 million dose of the vaccine, with instructions to report in a week. The next week the improvement had continued and the pupil was more dilated, although the synechiæ were quite annoying.

He had two more doses at intervals of a week, after which the eye was entirely quiet and free from inflammation. I saw him in the winter of 1913–14, at which time his vision was $\frac{20}{30}$, and the eye entirely free from inflammation, as it had been since I had seen him last.

Mr. S., had a cataract removed in the month of February, 1912. He was discharged from the hospital after about ten days with the eye apparently doing well. About a week later he developed a severe iridocyclitis which I treated with atropin and dionin with but slight improvement. He went to his home about thirty miles away and was fairly comfortable for a while. However, a few days later I received a telephone message from his local physician that he was suffering a great deal of pain. By using full strength dionin the pain was kept under control, but the inflammation continued about the same.

Owing to the bad condition of the roads and the extremely cold weather it was not until along in April that he could come to me for treatment.

I first tried subconjunctival injections of saline solution, but without any great amount of improvement.

He complained of some bladder irritation and, thinking that I might obtain some more light on the case, I made a culture from the urine. The culture showed staph. albus. He received an injection of 1000 million killed staphylococci from stock and I made up an autogenous vaccine from his own culture.

When he reported for the second injection a week later he showed considerable improvement. He was given 1000 million of the autogenous vaccine and told to report in another week, when the pain was entirely gone and the eye was clearing nicely.

He received three more doses in all and the eye became entirely quiet and free from inflammation.

About six weeks later I needled the eye to try and clear the pupil, which was obscured by exudate. The severe inflammation immediately recurred. I gave him one dose of the old vaccine which remained, and took another culture from the urine.

The organisms appeared the same, but the autogenous

vaccine made from them was entirely worthless, not producing the slightest bit of improvement. After giving two doses of this without effect, I changed to a stock staphylococcic vaccine, with the result that the improvement started immediately and the eye cleared up.

The eye has remained free from inflammation up to the present date, although I have done a slight needling to try and get some more vision. At present he sees moving objects with the eye.

These cases seem to show that vaccine treatment, or, as I have called it elsewhere, immuno-therapy, is of value in some cases of staphylococcus infection of the eyes, and also tend to confirm the statement that staphylococcus is capable of causing and often does cause a non-suppurative iritis or iridocyclitis.

Another recent case illustrating the last point: Miss K. consulted me on March 25, 1914, for an iritis of about a week's standing; the pupil was contracted and bound down by adhesions; there was a large amount of ciliary congestion and she complained of a great deal of pain.

I could find on careful examination no lesions elsewhere in the body to account for the trouble; so started to treat the case symptomatically, with strong atropin solution to try and dilate the pupil, and dionin to relieve the pain.

This treatment continued until April 4th, with very slight improvement. Then, thinking that the case might be staphylococcic in origin, I gave her an injection of 1000 million of the vaccine.

Four days later she returned, with the pain nearly gone and redness at least half gone. She received another dose of the same quantity, and another in five days more, when the inflammatory reaction had entirely subsided.

In view of this and other similar results, it would seem that it would at least do no harm to try this method of treatment in cases of obstinate iritis of unknown ætiology.

GLASSES FOR PROTECTING THE EYES IN INDUSTRIAL PROCESSES.[1]

By M. LUCKIESH, Esq., Physicist, Nela Research Laboratory, National Lamp Works of General Electric Company, Cleveland, Ohio.

(*With one illustration in the text, and four Text-Plates, VI., VII., VIII., and IX.*)

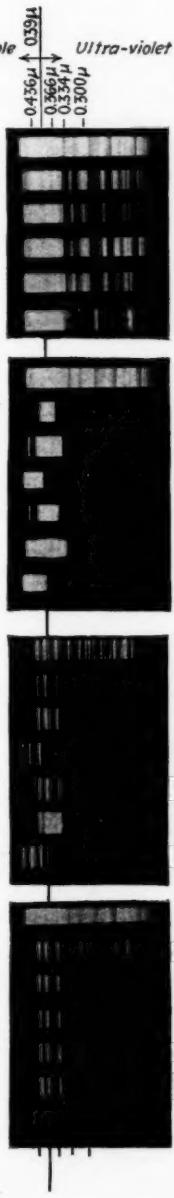
Synopsis: While it has been quite well established that there is little or no danger to eyesight from ultra-violet radiation when illuminants are properly used for ordinary purposes of illumination, occasions do arise in the industries where it is necessary to protect the eyes from ultra-violet rays and excessive amounts of radiant energy. This protection is accomplished by means of glasses which do not transmit the ultra-violet energy and which also reduce the retinal image to a safe brightness. Colorless or neutral glasses are to be preferred, but no glasses of this character have been found to be wholly satisfactory. As a general solution of the problem of eye protection it is proposed that a yellow-green glass totally absorbing ultra-violet be combined with a shade of smoke glass of such density as to reduce the brightness of the retinal image to a safe degree. Transmission curves of several characteristic glasses are shown. Spectrograms of the light from a quartz mercury arc and from an iron arc have been made through many samples of glass. For many cases the spectrograms provide sufficient data for analyzing the absorbing property of the glass. A brief account of experience with goggles and glasses in the industries is given. The paper is not intended as an exhaustive treatise on the subject, but data presented indicate the limitations and advantages of many common glasses and furnish information which has been collected for some time past.

INTRODUCTION.

THE radiation from heated substances can be harmful to vision in several ways. The destructive effect of ultra-violet rays upon animal tissue has long been recognized. It is

[1] A paper presented at a meeting of the New York Section of the Illuminating Engineering Society, April 9, 1914.

ILLUSTRATING M. LUCKIESH'S ARTICLE ON "GLASSES FOR PROTECTING THE EYES IN INDUSTRIAL PROCESSES."



	Exposure (Seed's 23) sec.	Transmission coefficient of specimen for tungsten light at 1.25 w.p.c.
GROUP A.		
1. Iron arc (bare)	½	
2. Iron carbon arc { Iron above / Iron positive }	½	
3. Iron carbon arc { Iron above / Iron negative }	½	
4. Iron carbon arc { Iron below / Iron positive }	½	
5. Iron carbon arc { Iron below / Iron negative }	½	
6. Carbon arc	½	
GROUP B.		
7. Iron arc (bare)	½	
8. Oxy-acetylene welders, K	3	0.002
9. Smoke, No. 8 shade	3	0.04
10. Akopos	3	0.50
11. Oxy-acetylene welders, K	10	0.002
12. Smoke, No. 8 shade	10	0.04
13. Akopos	10	0.50
GROUP C.		
14. Quartz mercury arc	½	
15. Oxy-acetylene welders, K	3	0.002
16. Smoke, No. 8 shade	3	0.04
17. Akopos	3	0.50
18. Oxy-acetylene welders, K	10	0.002
19. Smoke, No. 8 shade	10	0.04
20. Akopos	10	0.50
GROUP D.		
21. Iron arc (bare)	½	
22. Quartz mercury arc	½	
23. Fieuzal, light	½	0.86
24. Clear glass	½	0.92
25. Cobalt blue, dense	2	0.02
26. Celluloid	1	0.60
27. Signal green, medium	2	0.001

not definitely known which rays are the most destructive to animal tissue, although it is a fact that the rays of extremely short wave-lengths are very active in producing painful inflammation of the anterior surface of the eye. This fact has been demonstrated many times in working with light sources emitting large quantities of ultra-violet rays. Harmful effects arise sometimes when no glass intervenes between the eye and the source of these rays, while under the same conditions, with the exception that a glass globe has enveloped the source, no harmful effects have arisen. However it is quite likely that no harmful effects arise from the ultra-violet radiation from ordinary illuminants when the latter are used properly for illuminating purposes. There are, however, many special uses and industrial processes which require illuminants rich in ultra-violet radiation, all of which demand protection of the eyes by means of transparent glass media.

Another danger is met in these instances—namely, excessively bright images upon the retina. There are on record many injuries of this character, some of which are permanent. Again in the ordinary use of illuminants this danger is avoided by screening the light sources from the eye by means of shades or diffusing envelopes.

Another possible cause of impairment of vision might arise from the absorption of excessive energy by the eye media. The thousands of cataracts encountered yearly in tropical climes suggest the possibility of the energy effect as the cause. Again it might be attributed to the ultra-violet rays. However, the well-known glass-blowers' cataract implies that the ultra-violet rays can hardly be the cause for molten glass emits an exceedingly small amount of these rays.

The available data regarding the transmission of the eye media indicate that, with the exception of the short-wave ultra-violet radiation, the eye media transmit radiant energy practically the same as water does. Pure water, however, is transparent to ultra-violet rays, while the eye media are not. Scarcely any of the ultra-violet rays can reach the retina, for they are absorbed by the cornea and the lens. The various eye media vary in their absorptivity for ultra-violet rays. The cornea has about the same opacity for ultra-violet radiation as ordinary spectacle glass, transmitting no rays of shorter

wave-length than about 0.295 μ. The lens, however, absorbs a large fraction of the energy from 0.295 μ to the visible. Rays of wave-length in the neighborhood of 0.385 μ are strongly absorbed, as is indicated by the fluorescence of the lens under radiation of this wave-length. In general ultra-violet rays of shorter wave-length than 0.350 μ can not reach the retina in great amounts, although there seems to be a region at about 0.325 μ which does not suffer as great absorption in the eye media as the radiation of adjacent wave-lengths. It is claimed by some that damage done to the retina is due to these rays. However, this paper, in dealing with screens for absorbing ultra-violet radiation and for reducing the intrinsic brightness, is not primarily concerned with the actual transmission of the eye media, chiefly because of the lack of knowledge regarding the exact rays that are harmful. Owing to the scanty knowledge on this subject, it is well to protect the eyes from excessive ultra-violet radiation as is encountered in certain industrial processes such as arc and oxyacetylene welding, and many other processes in the steel industries, as well as in the special uses of sources rich in ultra-violet radiation in photography, medical practice, etc. No attempt will be made to prescribe glasses for all cases, but data and experiences which have accumulated will be recorded.

TRANSPARENCY OF VARIOUS MEDIA

There are several means of studying the transparency of media for invisible ultra-violet rays. The method which will be found most readily applicable in many cases is that of photography. A spectrograph with a quartz optical system affords a simple means of roughly determining the transmission of any medium. However, when the transmission is to be accurately determined, the photographic method is a very tedious procedure. The photographic action is determined by the density of the plate. In plotting the density against the logarithm of the illumination, a straight line relation is found over a certain range of illumination. This straight line region is taken as the region of correct exposure. By no means is the density of the silver deposit proportional to the logarithm of the intensity of radiation throughout any extremely wide range of illumination. Further, rays of various wave-lengths

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	Exposure (Lantern slide plate) sec.	Transmission coefficient of specimen for tungsten light at 1.25 w.p.c.
GROUP E.		
28. Quartz mercury arc	½	
29. Clear glass, 1/16" thick ..	½	0.92
30. Amber, medium, X.....	4	c.50
31. Kosma	1	0.83
32. Electric smoke	480	o+
33. Smoke X	3	0.015
GROUP F.		
34. Quartz mercury arc	½	
35. Amber, medium, X.....	15	0.50
36.		
37. Smoke X	6	0.015
38. Euphos, 3/64" thick	8	0.81
39. Thermoscopic	1	0.86
GROUP G.		
40. Quartz mercury arc	½	
41. Distilled water (1 cm.)..	½	0.93
42. Clear glass, 1/16" thick ..	½	0.92
43. Smoke A	1½	0.36
44. Smoke C.....	2½	0.20
45. Smoke A + C.....	7	0.07
GROUP H.		
46. Quartz mercury arc	½	
47. Euphos, 1/64" thick	1	0.90
48. Amber, light shade.....	3	0.67
49. Amber, medium shade..	6	0.45
50. Amber, medium, X.....	20	0.50
51. Smoke X	15	0.015

show different relations between density of the silver deposit and the illumination. These relations should be determined for various standard wave-lengths.

The procedure adopted by the writer is briefly as follows: The light of a quartz mercury arc reflected from a magnesia block was used as a source of ultra-violet radiation. Its spectrum was formed by a small quartz spectrograph, the slit being wide enough to furnish bands from each ultra-violet line of sufficient width for photometering. A series of exposures was made, of equal length, but with different known illuminations of the magnesia surface. Following these, exposures of the same length were made through the media to be examined, with known illumination. The photographs were measured for density on a Marten's polarization photometer and curves were plotted between density and illumination for each line. From these curves the corresponding intensities of illumination (*i.e.*, transmission) were read off for each line of each negative exposed through the specimens. By taking into account the relative illuminations of the magnesia block, the transmission at each wave-length was readily obtained. The same method could be applied to a determination of the relative intensities of the various ultra-violet rays of any illuminants.

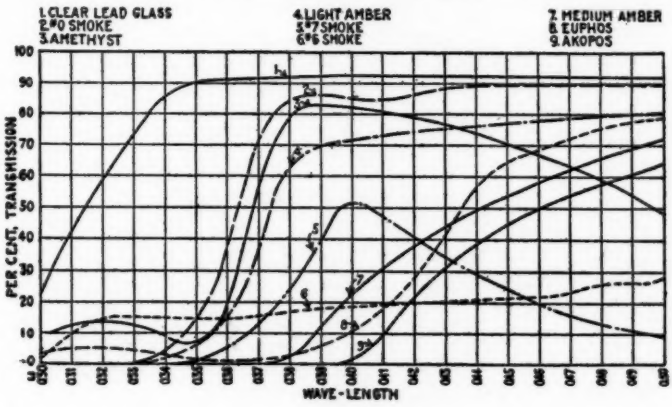

FIG. 1.

In Fig. 1 are shown the transmission curves of various representative glasses. Only the short-wave end of the spec-

trum has been considered here. It will be noted that the transparency of clear lead glass remains unchanged to rays as short as 0.35 μ when it begins to absorb, becoming opaque to rays somewhat shorter than 0.30 μ. The smoke glasses are representative of many examined. They show little tendency to selectively absorb ultra-violet rays and differ considerably in their characteristics. These glasses cannot conscientiously be recommended with safety for the protection of the eyes against excessive ultra-violet radiation. The amethyst glass absorbs more ultra-violet rays than clear glass yet is transparent far into the ultra-violet region. The amber glasses quite satisfactorily absorb ultra-violet rays but give rise to some objection from the standpoint of color. Several deep red glasses were examined and all were found to be opaque to ultra-violet rays but on account of the strong color should not be recommended except in very special cases. The transmission of Euphos glass decreases considerably in the ultra-violet, but shows a tendency to increase in transparency in the region of 0.32 μ. This transparency to short-wave ultra-violet rays becomes quite marked in less dense specimens. The most satisfactory glass yet examined from several standpoints is the Akopos specimen. Its color is a light yellowish-green, and samples showing but little objectionable color are quite effective in absorbing ultra-violet rays. The color of this glass is preferable to amber for various reasons which will be considered later. None of the colorless glasses examined has been found to absorb all the ultra-violet rays which are considered as possibly harmful.

SPECTROGRAMS.

Owing to the absence of collected data upon this subject it seems of interest to show a number of spectrograms illustrating the transparency of various media to rays of different wavelength. For this purpose a mercury arc is well suited owing to its constancy. A source giving a continuous spectrum is more desirable, but such a source emitting considerable ultra-violet radiation is unavailable. The iron arc is often used, but is used by the writer only in special cases. The quartz mercury arc on account of its constancy is well suited for obtaining

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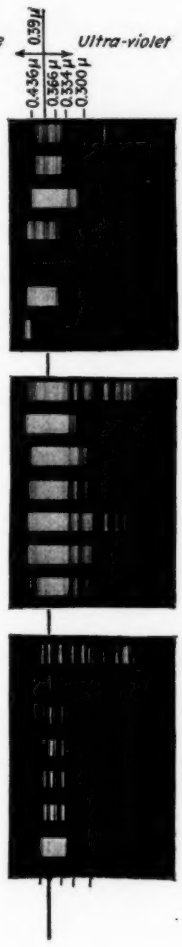


	Exposure (Seed's 23) sec.	Transmission coefficient of specimen for tungsten light at 1.25 w.p.c.
GROUP I.		
52. Iron arc (bare)	½	
53. Clear glass, $^1/_{16}$″ thick ..	½	0.92
54. Cobalt blue, dense	2	0.02
55. Canary, light	2	0.82
56. Signal green, medium ..	8	0.001
57. Signal blue, medium ...	4	0.11
58. Green, dense.....	8	0.20
GROUP J.		
59. Iron arc (bare)	½	
60. Clear glass	2	0.92
61. Cobalt blue, dense	2	0.02
62. Gelatine film, purple ...	2	0.17
63. Gelatine film, blue.	2	0.43
64. Gelatine film, green....	2	0.67
65. Gelatine film, orange...	2	0.53
GROUP K.	LANTERN SLIDE	
66. Quartz mercury arc	½	
67. Smoke CK.....	2	0.001
68. Smoke CK.....	10	0.001
69. Smoke CK.....	20	0.001
70. Smoke DK.....	1'	0.15
71. Smoke DK.....	2	0.15
72. Smoke DK.....	5	0.15

qualitative data for rough comparison, and under certain conditions can be used successfully in obtaining accurate transmission data.

The spectrograms are divided into groups headed in all cases, excepting Group A, by the spectrum of the unobstructed light of the illuminant used in each particular group. The spectrograms are numbered consecutively for further convenience and the exposure times are given in order to roughly indicate the transparency of the specimen. In the last column are given the transmission coefficients of the specimens for the total visible light from a tungsten lamp operating at 1.25 watts per candle or at a temperature approximately 2,030° C. or 3,700° F.

In Group A is shown the spectrum of the iron arc. The other spectrograms in the same group with the exception of 6, which is that of the carbon arc, were obtained with a carbon-iron arc. The carbon and iron electrodes were interchanged in position and reversed in polarity as noted. As is to be expected, when the iron is positive the light is richer in ultra-violet rays, as is shown in 2 and 4.

In Group B are shown the spectrograms through two smoke glasses that were proposed for use in arc welding; 8 and 9 show the great difference in transparency of these glasses to ultra-violet rays. Of course their transparency to visible light differs very much, but smoke glasses are found to have very different characteristics and their transparency to visible light is no safe criterion in estimating their value in absorbing ultra-violet rays. Their peculiarities are emphasized in 32 which is a very dense smoke. The glass is more transparent to rays near 0.360 μ in wave-length than to the violet rays. Smoke glasses are also considered in other groups.

Euphos glass which has received some attention in the past is seen in 38 and 47 to be transparent to ultra-violet rays of rather short wave-length. The amber and Akopos specimens do not show such transparency to the shorter ultra-violet rays even after prolonged exposure of the photographic plate.

In Group I and J are the spectrograms illustrating the transparency of various common glasses which are often used in the industries. It is seen that the cobalt-blue glass is more transparent to ultra-violet radiation than a clear glass of the same thickness. The clear glass used was a lantern-slide cover glass.

This difference is best shown in 60 and 61 where the exposures were equal. It is significant to note that the clear glass is approximately 46 times more transparent to visible light than the cobalt-blue glass. The light colored gelatine films used on the stage show a high degree of transparency to ultra-violet rays. Of course they are generally used with glass optical systems which considerably decreases the possibility of injury to the eye.

No detailed discussion of the spectrograms will be entered upon because the information it is desired to present accompanies the photographs. On combining the exposure time and the transparency to visible light with an inspection of the various spectrograms interesting comparisons can be made.

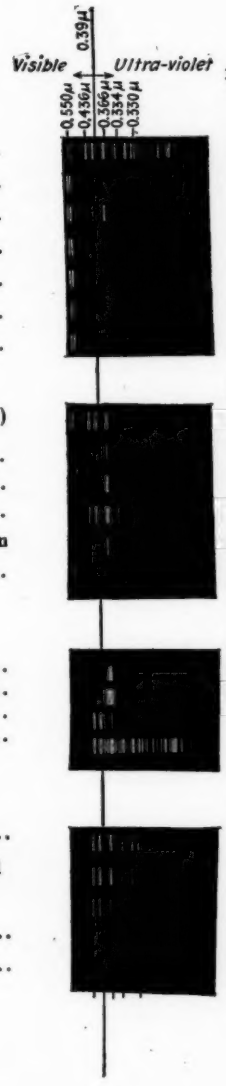
SPECIAL SCREENS.

A few special screens may be of interest. Yellow screens are often used in correcting photographic plates to give true values. The screens may also be used for visual purposes. In Group M a number of yellow screens were made by flowing the gelatine containing the dye upon plate glass. The total glass is about ¼ inch (6.35*mm*) thick. The screens are of approximately the same transparency to visible tungsten light and are very closely of the same color. It is noted that three of them transmit some deep violet and ultra-violet rays, while the other three absorb all energy of shorter wave-length than about 0.470 μ.

In Group N are shown some special screens devised for the purpose of transmitting ultra-violet for special uses; 81 and 82 show the effect of combining certain aniline dyes; 83 is a purchased screen whose composition is unknown to the writer. It was intended to transmit only ultra-violet rays, but it does not absorb all the visible rays that are photo-chemically active on the plate used. When combined with aniline green it is quite satisfactory as shown in 84. The green dyes, 81 and 82, transmit some ultra-violet and thereby differ from that shown at 85. The results of prolonged exposures with the acid green and ethyl violet combination are shown at 86 and 87.

A dye famed for its absorption of ultra-violet rays is esculine (88). It is highly transparent to visible rays and fluoresces a faint blue under ultra-violet rays.

ILLUSTRATING M. LUCKIESH'S ARTICLE ON "GLASSES FOR PROTECTING THE EYES IN INDUSTRIAL PROCESSES."



	Exposure (Cramer spectrum) sec.	Transmission coefficient of specimen for tungsten light at 1.25 w.p.c.
GROUP M.		
73. Quartz mercury arc.....	½	
74. Aurantia.....	2	0.44
75. Orange G.....	2	0.54
76. Uranin	2	0.54
77. Tartrazine	2	0.57
78. Fluorescin	2	0.51
79. Aniline yellow	2	0.52
GROUP N.	(Cramer spectrum)	
80. Quartz mercury arc (glass)	½	
81. Aniline green + resorcine blue	20	0+
82. Acid green + ethyl violet..	20	0+
83. Ultra-violet screen	5	0.001
84. U. V. screen + aniline green	20	0+
85. Napthol green	2	0.04
GROUP O.	(Lantern slide)	
86. Acid green + ethyl violet..	120	0+
87. Acid green + ethyl violet..	300	0+
88. Esculine.....	½	0.87
89. Quartz mercury arc.....	½	
GROUP P.	(Lantern slide)	Thickness of aqueous solution cm.
90. Nitrosodimenthylaniline ..	½	0.01
91. (Various depths contained	2	0.2
92. in a quartz cell)	9	0.5
94.	30	1.0
95.	90	1.0

A dye which has been proposed for the purpose of transmitting only ultra-violet rays is nitrosodimenthylaniline. Group P shows the results obtained with an aqueous solution of this substance of various depths. These spectrograms show at least that the aqueous solution is not highly satisfactory for this purpose.

GOGGLES IN THE INDUSTRIES.

While goggles have long been recommended in the industries, they have received special attention since the inauguration of the "Safety First" movement. The indifference and bias of the workman are factors which must be considered in prescribing goggles for the various processes. Of course the conditions found in any particular case are the determining factors in prescribing goggles. In processes where excessive heat is encountered, the goggles must have no metal parts touching the skin. In any case the lens must have sufficient mechanical strength, it must absorb the ultra-violet rays in cases where these are encountered in excessive amounts, it must be of sufficient density to reduce the retinal image to a safe brightness, and it should be as free from color as possible. If colored, it is preferable that it be of a color that will not distort colors to any great extent.

Owing to the many processes found in the steel industry, a brief account of experiences in studying the conditions accompanying the various processes, and the requirements of glasses for the protection of the eyes, should be of interest. In those cases where mere grinding or chipping was done, clear thick lenses in metal screens are of course satisfactory In all processes involving high temperatures, it seemed advisable to prescribe glasses which eliminated ultra-violet rays. This simplified the matter, for such a glass as Akopos would be satisfactory and could be adopted as a standard. With this glass could be combined any shade of satisfactory neutral tint glass, its density depending upon the process involved and the amount of moving about required of the workman. For arc welding a very dense neutral tint glass combined with Akopos (a yellow-green glass) was recommended. For the oxyacetylene and oxyhydrogen welding processes a somewhat lighter shade

of neutral tint glass was used. The shade of neutral tint glass necessary of course is still lighter for the processes merely involving molten iron and steel, varying in density approximately with the temperature involved. Great advantage was of course experienced by actually consulting the workman. An interesting case was encountered in the lap-welding process. Here the welder judges the correct temperature visually. While the temperature is not extremely high it seemed advisable to suggest the use of glasses which absorb the ultra-violet rays quite effectively. The amber and Akopos were the only specimens at hand which answered this purpose. The welder was quite at a loss in judging temperatures through the amber glasses; however, he became enthusiastic over the results obtained with the yellow-green glass, claiming that he suffered no difficulty whatever. This brings to mind the fact that through a yellow-green glass transmitting only a limited region of the spectrum the relation of intensity and temperature appears practically the same as to the unobstructed eye when the luminous substance radiates light approximately the same as a black or a gray body. Years ago Crova suggested a method of photometry involving this principle. The Akopos has a maximum of transmission at 0.550 μ where hue changes slowly with the wave-length—that is, where hue sensitivity is low. Further a yellow-green glass absorbs light only at the extremes of the spectrum, thus in general distorting colors to a less degree than glass of any other color. These facts point more favorably to the use of a light shade of yellow-green glass than an amber glass. In an industry involving many processes, such as the steel industry, it appears to simplify matters and to assure safety if a glass which absorbs ultra-violet and which is satisfactory and inconspicuous in color is used universally in processes where hot metal is encountered, combining with this in each particular case a neutral tint glass of proper density to decrease the brightness of the retinal image to a safe degree. This procedure insures protection to the workman at all times.

SUMMARY.

The problem of eye protection in processes involving high temperatures and excessive amounts of ultra-violet radiation

must be considered from two standpoints. The ultra-violet radiation must be screened from the eye and the retinal image must be reduced to safe brightness.

The exact ultra-violet rays that are active in destroying animal tissue and causing irritation are not known. It is known that the rays of extremely short wave-length which are not transmitted by ordinary clear glass are harmful. Whether any rays of longer wave-length than 0.300 μ are harmful is a problem yet to be solved. In the absence of such knowledge it is safe to protect the eyes against all the ultra-violet rays in many industrial processes such as arc welding.

No neutral tint glass was found which would absorb all the ultra-violet rays. Therefore a simplified scheme is found in adopting a glass which does eliminate these rays and combining with it where necessary a neutral tint glass of such density that the retinal image is reduced to a safe brightness.

Transmission curves for short-wave radiation are shown for various representative glasses.

Spectrograms showing the transmission of various media for the short-wave radiation from the quartz mercury arc and the iron arc are presented, also the exposure times and transmission coefficients for visible tungsten light for the purpose of rough comparison.

A number of spectrograms are presented which show the transmission of screens useful for special purposes. Some are intended to absorb the ultra-violet rays, others are intended to transmit only the ultra-violet rays. These are chiefly for photographic purposes but are of value in other processes.

A brief account is given of experience with goggles and glasses in the industries.

As no neutral tint glass was found which totally absorbed the ultra-violet, a yellow-green glass was chosen as most desirable for several reasons. It was found that workmen in welding processes preferred this glass to any other color. They successfully used this at once while condemning amber glasses very heartily. Colors are distorted less through this glass than through glass of any other color. Another significant fact is that the relation of the temperature and luminosity for black or gray bodies is practically the same through a yellow-green glass as to the unobstructed eye.

These data are presented because of increased demand for such knowledge having been obtained largely on account of requests for examination of glasses and investigation of actual conditions found in industrial processes. Of course glasses should be tested at least by means of a spectrograph before adoption, but the data presented indicate the limitations and advantages of the various representative glasses and furnish some information gleaned from experience.

MICROSCOPICAL AND CHEMICAL ANALYSIS OF FOUR CASES OF BLOOD-STAINING OF THE CORNEA

By HOWELL L. BEGLE, M.D., Detroit, Mich.
(Formerly Voluntary Assistant.)

[From the Eye Clinic (Director: Prof. A. Elschnig) and the Physiological-Chemical Institute (Director: Prof. von Zeynek) of the German University of Prague.]

(*With one illustration on Text-Plate X.*)

THE following report relates to four cases exhibiting that yellowish green discoloration of the cornea which infrequently develops after injury or disease of an eye accompanied by hemorrhage into the anterior chamber, and to which the English expression "Blood-Staining of the Cornea" and the German term "Durchblutung der Hornhaut" are most often applied.

The report includes the clinical notes of the four cases, in addition to the results of microscopical examinations of pathological material, spectroscopic examination of the cornea from a fresh case, and certain experiments of a chemical nature undertaken in an attempt to discover the identity of the small, highly refractile bodies, which, thickly disseminated through all but the peripheral part of the cornea, lend such a unique appearance to the microscopical picture.

Three of the cases are from the eye clinic of the German University of Prague, one occurring during the service of the present director, Professor Elschnig, and two dating back to the period of his predecessor, Professor Czermak. The fourth case was a private patient of Professor Elschnig's. For the privilege of observing this last case, as well as for the oppor-

tunity of studying the collective pathological material, I desire to acknowledge my indebtedness to Professor Elschnig. In making the spectroscopic and chemical examinations, I was fortunate in having the efficient help and guidance of Professor von Zeynek, director of the Physiological-Chemical Institute in the same university.

CASE 1.—*Marie V., 37 years old, was admitted to the eye clinic of the German University of Prague on November 22, 1911.* Six weeks previous to admission, she was struck in the right eye by a stick of wood.

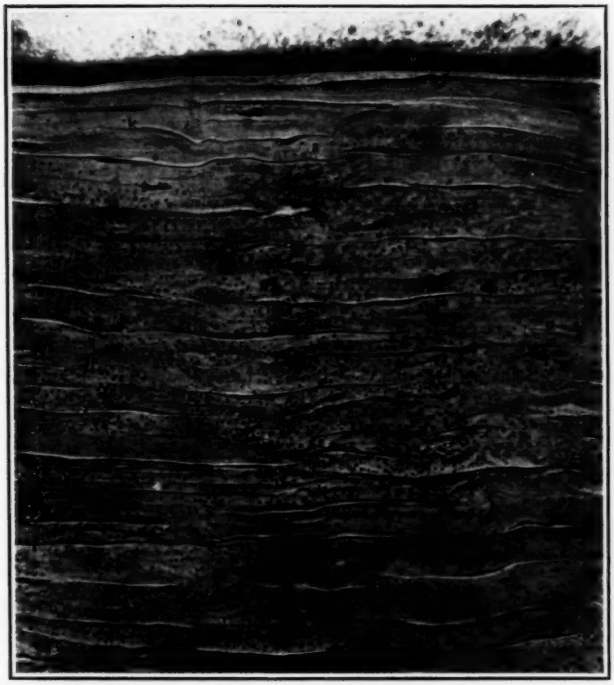
Status, November 22, 1911: Left eye normal. Right eye: Upper lid slightly swollen. Divergent squint. Bulbar conjunctiva red and swollen. Cornea dull and presents a large, disciform opacity of a diffuse yellowish green color. Adjoining the limbus there is a transparent peripheral zone *2mm* in width. Epithelium over the opacity is very uneven. Anterior chamber deep, in its lower part a hyphæma, *2mm* in height. The iris is largely covered by blood-clot. Pupil is eccentric toward the temporal side, is *6mm* wide, and reactions fail. Blood-reflex from pupillary area. Vision: Candle-flame in front of eye. Projection fails.

Diagnosis: R: Contusion of the bulb, hæmophthalmia, blood-staining of the cornea, divergent strabismus.

Nov. 25, 1911: Exenteration of the right bulb under ganglion anæsthesia; there was a flow of bloody fluid from the bulb when it was opened.

Microscopical Examination of the bulb in December, 1912: Conjunctiva and episclera thickened and œdematous. Both are infiltrated by small round cells which occur most thickly about the dilated blood-vessels. Infiltrated areas of smaller size surround the dilated vessels of the sclera. In the lower part of the anterior chamber there is a large blood-clot which is breaking down and exhibits various stages in the process. A layer of varying thickness, formed by blood-clot and fibrinous coagulum, covers the structures bordering on the anterior chamber. On Descemet's membrane there are leucocytes containing pigment granules and numerous pigmentary deposits. A thin connective-tissue membrane occupies the pupillary area. The iris and ciliary body show chronic inflammatory changes of moderate degree. Lens *in situ*. The pectinate ligament is thickened and in its meshes are many blood-cells and pigment clumps. The posterior chamber, as well as the space between the lens and detached retina, is filled with blood and coagulum in which are seen both deep and faintly staining red blood-cells, phagocytes containing pigment, and detritus in the form of granules of

To Illustrate Dr. Begle's Article on "Microscopical and Chemical Analysis of Four Cases of Blood-Staining of the Cornea"



Central and deeper layers of the cornea showing refractile bodies. (Giemsa. Retouched photograph, magnification 450.)

varying size and staining capacity. The suprachoroid is replaced in many places by young connective tissue in which are numerous areas containing blood cells and pigment granules.

The corneal epithelium is somewhat desquamated. As a whole the corneal lamellæ appear normal except for a fine granulation, which is visible, even with the low power, in unstained sections mounted in glycerine. Bowman's and Descemet's membranes appear to be intact. There are no new-formed blood-vessels and no hemorrhagic areas in the corneal tissue. With the high power, the granular appearance of the cornea is seen to be due to the presence in the parenchyma of innumerable, small, colorless, highly refractile bodies of round or oval form. They are absent in a peripheral zone 1–2*mm* wide, and occur most thickly in the central layers of the cornea. In macerated specimens the bodies are seen to lie, for the most part at least, within the lamellæ. In the deeper parts of the cornea, the corneal corpuscles appear somewhat irregular and the wandering cells increased in number. Toward the periphery brownish pigment granules of varying size and form are observed occasionally in the corneal spaces. More are seen in the neighborhood of the pectinate ligament than elsewhere.

CASE 2.—*Franz S——, 18 years old, was admitted to the German University eye clinic of Prague (Professor Czermak) on March 21, 1905.* On the previous day his right eye had been severely injured in a quarrel with a fellow workman, who had seized him violently by the head and thrust his face against the corner of a table.

Status, March 21, 1905: Left eye externally and ophthalmoscopically normal. Right eye: Lids reddened and swollen. Superficial bruise on the lower lid near margin of cheek. Conjunctiva of lid injected but not swollen, that of bulb œdematous, overhangs limbus, and is undermined by a hemorrhage. Above and outward, there is a break in the continuity of conjunctiva and sclera, which is near the limbus and tangential to it. The wound is about 1*cm* long, gapes, and contains uveal tissue and vitreous. Cornea intact; shows marked horizontal wrinkling. Anterior chamber very deep and presents a fresh hyphæma 4*mm* high. Iris for the most part covered by a cloudy red mass. Tension markedly diminished. Amaurosis.

March 25, 1905: In the middle of the cornea there is a pale grayish disk.

April 3, 1905: Above, below, and inwards there is a clear zone 2*mm* wide, while in center of cornea there is a reddish gray disk.

April 4, 1905: The entire periphery of cornea is clear, disk grayish green.

Diagnosis: Perforating wound of sclera, prolapse of ciliary body and vitreous, hæmophthalmia, blood-staining of cornea.

April 11, 1905: Enucleation.

Microscopical Examination, January, 1913: Blood-vessels of conjunctiva and sclera dilated. The wound of sclera communicates with anterior chamber and contains ciliary body and root of iris. Lips of wound contain young scar-tissue. Blood-clots in anterior chamber, one adjoining the wound is undergoing organization. Lens absent. Complete detachment of retina. Blood-clot in posterior chamber and subretinal space. A few clumps of leucocytes in anterior chamber and a few patches of small round-cell infiltration in choroid, but inflammatory signs not pronounced.

Surface epithelium of the cornea desquamated. Bowman's and Descemet's membranes intact in all sections examined. No free red blood-cells in cornea. The small, highly refractile bodies commonly met with in blood-staining of the cornea are thickly scattered through the corneal stroma except at the periphery where in a zone *2mm* wide they are absent. They are most numerous in the central portion and appear as a whole smaller than the bodies described in the previous case. A few yellowish pigment granules occur in some of the corneal spaces, where they lie close to the nuclei of irregularly formed corpuscles.

CASE 3.—*Johann B——, 24 years old, was admitted to the German University eye clinic of Prague (Professor Czermak) on June 29, 1905.* When a small boy 5 years old, he was struck in the left eye with a stick. The eye was inflamed for seven weeks following the injury, but it was not until his seventeenth year that he noticed a decrease in the visual power of this eye. For about a year and a half the eye has been red and painful, and it has remained in this condition despite treatment.

Status, June 29, 1905: Right eye normal. Left eye: Photophobia, epiphora; palpebral conjunctiva injected, Cornea dull, stippled, and exhibits a central, olive-green disk-shaped opacity, whose diameter is *8mm*. Periphery of the cornea somewhat grayish. Two small round maculæ below and inwards at the limbus. Anterior chamber very shallow; hyphæma, *3mm* high, of reddish brown color. Details of iris can not be made out but pupil appears to be irregular. Tension decreased. Amaurosis.

Diagnosis: Hæmophthalmia, blood-staining of cornea.

July 18, 1905: Enucleation.

Microscopical Examination, December, 1912: Blood-vessels of conjunctiva and episclera dilated. Basal cells

of corneal epithelium slightly irregular. Descemet's membrane apparently intact. Small, colorless, highly refractile bodies thickly disseminated through the corneal parenchyma. Absent in a peripheral zone *2mm* wide. Anterior chamber filled with blood-clot, likewise the meshes of pectinate ligament. Iris atrophic. Cortex of lens shows calcareous degenerative changes. Complete detachment of retina. Subretinal space filled with blood and coagulum. Pigment epithelium and choroid markedly atrophic.

CASE 4.—*Leopold K——, 19 years old, came under the care of Professor Elschnig in November, 1912.*

In September, 1911, he became infected with both gonorrhea and syphilis. In October, of the same year, he received a salvarsan injection and four courses of mercury. In the beginning of December, 1911, the right eye became affected with an iridocyclitis, and toward the end of December he received another salvarsan injection and one course of inunctions with mercury. On account of swelling of the joints, antisyphilitic medication was discontinued and gonorrheal vaccines and the bath-cure at Teplitz substituted. The patient, who was much emaciated, developed convulsive and paralytic attacks of cerebral origin but further anti-syphilitic measures were not instituted. On account of the iridocyclitis and increase of tension, puncture of the anterior chamber and several iridectomies were performed. Vision from the beginning was very poor. There were frequent recurrences of the inflammation with intraocular hemorrhages.

The patient was first seen and examined by Professor Elschnig, November 12, 1912. He showed some mental disturbances, which, in the opinion of Professor Margulies, were suspicious of a beginning progressive paralysis. There was a thick opacity of the right eye at the corneal margin below. The inner and upper part of the cornea was occupied by a deep, yellowish green disk-shaped opacity, which at the nasal side extended nearly to the limbus, although it, in fact, nowhere reached it. The surface of the cornea was stippled. In the anterior chamber there was a large hyphæma. The iris was scarred as a result of the iridectomies, the pupil invisible. With diascleral transillumination a large defect in the pigment layer of the iris was visible. Tension decreased. Eye painful on pressure. Light sense and projection defective. Wassermann reaction strongly positive.

Professor Kreibich tried intramuscular calomel injections, with iodides internally, but in spite of treatment there was constant pain with repeated hemorrhages into the anterior chamber.

Dec. 12, 1912: Exenteration of the bulb with implantation of fat. Root of iris completely adherent to back of cornea. Vitreous, fluid and turbid.

Microscopical Examination of portions of the cornea, December 12, 1912: Highly refractile bodies present throughout except in a peripheral zone. Brown pigment particles occasionally met with in the corneal interspaces. No free red blood cells in corneal tissue.

The questions of chief interest at once suggested by the clinical and microscopical features of this series of cases, as well as by similar cases reported by previous observers, are:

1. *What is the primary cause of the corneal opacity, and what secondary conditions favor its formation?*

2. *What is the nature and origin of the small, highly refractile bodies that are distributed through the corneal tissue?*

The greenish or brownish color of the opacity and its constant association with the presence of blood in the anterior chamber form a basis for the belief of practically all observers that the opacity results from the entrance of blood coloring matter into the corneal tissue.

That in the great majority of cases, there is not a direct infiltration of blood into the cornea is evident from repeated microscopical examinations showing an absence of free red blood cells in the corneal stroma. It must be admitted, however, that a brownish opacity of the cornea may result occasionally from direct infiltration with blood. Römer (1) reports a case of this character, where the brownish disk-shaped opacity could be attributed to the presence in the corneal interspaces of free red blood cells which had entered the cornea apparently from the edges of a perforating scleral wound near the corneo-scleral margin. It is to cases of this type that the German term "Durchblutung der Hornhaut" is strictly applicable.

The view generally advanced by those who have had an opportunity of observing sections of the cornea microscopically is that the opacity results from the direct imbibition by the cornea of a solution of hæmoglobin from the anterior chamber. Support for this view has been furnished by both Vossius (2) and Römer, who were able to obtain a diffuse greenish or bluish color reaction from sections of the fixed cornea

which had been immersed in iron-staining reagents. The former, moreover, found a certain amount of brownish pigment in the corneal spaces which responded to tests for iron, and which he therefore considered to be hæmosiderin. The occurrence of similar iron-holding pigment has been noted by Treacher Collins (3), Weeks (4), and Verhoeff (5).

I have tried various tests for iron on the fixed cornea from each of the above described cases. In the third case a small amount of granular material lying close to the nuclei of the corneal corpuscles gave the iron reaction with Turnball's test. The refractile bodies did not react nor was I able to obtain a definitely positive diffuse reaction from the corneal sections as a whole.

It is to be expected that varying results should be obtained from iron tests on the fixed cornea, for in the hardening and fixing processes the hæmoglobin solution may be altered or may more or less completely escape from the corneal tissue. The same applies to the spectroscopic examination of the cornea. Both Römer and Collins examined the fixed cornea with the spectroscope and obtained merely a less distinct spectrum with absorption at the violet end. Gutman (6) examined a fresh cornea with special reference to a hypothesis of Römer's that the hæmoglobin solution in the cornea is split up into hæmatin and an albuminous body. It may be presumed that his results were negative, although he merely states in his report that the spectrum of hæmatin was not obtained.

The fourth case in my series furnished an opportunity for a spectroscopic examination of a fresh cornea. Immediately after the operation of exenteration of the bulb the cornea was examined with the Zeiss micro-spectroscope. According to Professor von Zeynek, there was an absorption of the extreme red end of the spectrum, and faint but distinct absorption bands were present in the green and blue portions; the spectrum as a whole being entirely similar to that of a methæmoglobin solution of the same color.

This spectroscopic finding conclusively establishes the fact, already suggested by other evidence, that in this condition a solution of hæmoglobin is imbibed by the cornea. To the presence of this hæmoglobin solution the greenish or brownish discoloration of the cornea must be ascribed.

The slow resorption of the blood from the anterior chamber, which is noted clinically in all of these cases, is probably the chief condition favoring the imbibition of hæmoglobin by the cornea, and in injury cases it may be accounted for by the rupture of the meshwork of the pectinate ligament which occurs frequently in both perforating and blunt injuries. In the fourth case of my series, the obstruction to the resorption of blood from the anterior chamber is explained by the adhesion of the root of the iris to the posterior surface of the cornea. Treacher Collins believes that increase of tension is an important factor in the production of the corneal opacity. In nine out of seventeen cases which he has observed, the tension was increased; in six, it was normal or decreased at the time of examination. The clinical records of the cases which I have reported are insufficient to either confirm or disprove his contention.

The small, highly refractile bodies occurring in the cornea have proven to be the most interesting and puzzling feature of this opacity, for they have in a remarkable manner resisted the efforts of all observers to disclose their identity. They are found in so many cases exhibiting this opacity that they appear to be almost characteristic of the microscopical picture, but several cases are on record in which they did not occur. Von Hippel (7) and von Michel (8) have each described a case in which hæmosiderin particles but no refractile bodies were present in the cornea. Also in Römer's case of direct bleeding into the cornea the refractile bodies were absent.

Baumgarten (9) was the first to examine microscopically a cornea exhibiting this opacity. He examined sections of the fresh cornea in salt solution and accurately described the morphological appearances of the bodies and their distribution in the cornea. He found that they were not stained by nuclear stains and that they were very resistant to acids, alkalis, ether, chloroform, and alcohol. By iodine and sulphuric acid they were tinged brown. In Baumgarten's opinion the bodies resembled certain low forms of micro-organisms (molds), but neither Leber nor Koch, to whom he sent his specimens, could concur with him in this view. Leber (10) pointed out the similarity of the appearance of the bodies to certain fibrin deposits occurring in the cornea in experimentally produced aspergillus

inflammations of the eye, and suggested that the refractile bodies were of fibrinous origin. While Vossius admitted that there was a marked similarity in the morphological features of the refractile bodies and the fibrinous deposits obtained by Leber, he found sufficient differences in the chemical behavior of the two structures to cause him to reject Leber's view. Eventually he concluded that the refractile bodies were colloid and hyaline degeneration products of the corneal fibrillæ. Collins advanced the view that the bodies were hæmatoidin particles. The latter substance, which is generally thought to be identical with bilirubin, is found in old extravasations of blood and is resistant to various reagents and solvents. Two very strong objections to Collins's assumption have been brought forward by Von Hippel and Römer, the former stating that hæmatoidin is soluble in chloroform, while the refractile bodies are resistant to this solvent, and the latter that hæmatoidin has an orange or yellowish tint whereas the refractile bodies are colorless. Römer examined the cornea with special reference to fibrin and various degenerations, colloid, hyaline, amyloid, and glycogen. From the refractile bodies he was unable to get a positive reaction for any of the tests used. Römer's own theory of the origin and nature of the refractile bodies is that the hæmoglobin solution imbibed by the cornea is split up by carbon dioxide in the tissue of the cornea into hæmatin and an albuminous body, and that the latter is precipitated in the crystalloid form of the refractile bodies. It was with special reference to the theory of Römer's that Gutman examined with the spectroscope a fresh cornea presenting the opacity, as already stated, and reported that he was unable to obtain the spectrum of hæmatin.

Vossius found that the bodies stained with eosin; Römer was able to secure good stains with hæmatoxylin-saffranin-picrine; Verhoeff, with Mallory's phosphotungstic hæmatoxylin.

The refractile bodies were found in the cornea of each case in the series that I have recorded. They stand out distinctly in unstained sections mounted in glycerine, and various fixing agents seemed to make no essential difference in their appearance. Good differential stains were obtained by Giemsa's, May–Grunwald's, and Pappenheim's methods for staining blood, when thin paraffine sections were used, the bodies

taking the basic part of the stain. The bodies did not give the color reactions for iron, nor was I able to obtain reactions for colloid, hyaline, glycogen, and amyloid.

In an attempt to obtain some further data which might help to identify the bodies, a number of micro-chemical examinations were made which may be grouped as follows:

Solvents: The refractile bodies were not soluble in alcohol, ether, chloroform, benzene, dilute and strong mineral acids and alkalis, glacial acetic acid, carbon bisulphide, pyradine (said to be a solvent of hæmatoidin), or molybdinic acid. After sections had stood for four hours in cold, concentrated acids and alkalis, the refractile bodies were apparently unchanged. When these reagents were warmed slightly, the cornea became disintegrated and the refractile bodies, appearing as short rods with rounded outlines, could be seen floating away in the surrounding fluid. Their ultimate fate was not ascertained.

Proteid reactions: Sections of the fresh cornea were treated with preparations of pepsin and trypsin at 40° centigrade for sixteen hours. The bodies were not digested. They appeared unaltered by the Biuret test. While the cornea was tinged red with Millon's reagent, no change in the physical features of the refractile bodies could be detected.

Tests for various split products of albumens: Solution of lead in potassium hydroxide (reaction for cystin); also solution of cadmium in ammonium chloride (reaction for cystin and sulphur). In neither case were the refractile bodies altered. Formol 1%—sulphur 55% (test for tyrosin), no yellow crystals. Alcoholic solution of anthrapurpurin (test for calcium), no color reaction.

Heat: The refractile bodies were changed neither in size, form, nor color when corneal sections were heated for ten minutes at a temperature of 150° C.; at 250° the cornea turned brown and the bodies appeared larger, darker, and less distinct.

Comparisons of the physical characteristics of various hæmoglobin derivatives under the microscope with those of the refractile bodies: Even the smallest particles of hæmatoidin examined under the microscope had a distinct yellowish tinge while the refractile bodies appear nearly if not quite colorless. I could detect no very close resemblance between the

refractile bodies and the various granular masses occurring in disintegrating blood-clots observed in the above described cases. Comparisons were made with various derivatives of hæmoglobin, which Professor von Zeynek had in his laboratory: with oxyhæmoglobin, hæmoglobin acted upon by sulphur dioxide in the light, digested met-hæmoglobin, hæmoglobin and hæmatin, but so far as I was able to judge from such a method of comparison, no particles similar to the refractile bodies in the cornea occurred in these specimens.

Most of the above-mentioned examinations were conducted on the fresh cornea as well as on corneas which had been subjected to various fixing and hardening fluids. A few, in which the fresh cornea was not employed, were made on the cornea preserved in 80% alcohol.

It is evident that the results obtained from these examinations leave the question of the nature and origin of the refractile bodies unanswered. Except for the fact that the bodies were stained by some of the commonly employed blood stains, from which I am not inclined to draw any definite conclusions, I was unable to obtain any reaction of a positive character. It is possible that the results obtained from those tests depending upon color reactions are somewhat unreliable, for, as Parsons (11) has pointed out, a faint color may perhaps be masked by the high refractility of the bodies.

The results of the examinations are of some value in an attempt to ascertain the nature of the bodies by a process of exclusion. The failure to obtain reactions for the various degeneration products of tissue, the absence of inflammatory changes in the cornea, the sharply defined appearance of the bodies, and their persistence apparently unchanged after the cornea had been disintegrated by acids and alkalis, lead me to believe that the bodies are foreign to the cornea. On account of their uniform distribution through the cornea in an area whose limits conform to those of the opacity, they appear to be introduced and to be derived from the hæmoglobin solution which is imbibed by the cornea. Inasmuch as they fail to give an iron reaction, are not digested by pepsin, and do not react with various tests for albumen, I would suggest that they are some elementary non iron-containing split product of hæmoglobin, despite the fact that positive reac-

tions for a number of the end-products of proteid disintegration were not obtained.

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THE SCIENTIFIC BASIS FOR THE TREATMENT OF ARTERIOSCLEROSIS WITH IODIDE OF POTASH.

By Dr. FERDINAND FLURY, Würzburg,

Translated from the *Archiv für Augenheilkunde*, Vol. LXXV., 1913.

ONE of the most frequently used drugs in ophthalmology is potassium iodide. It is used in chronic inflammatory conditions, in syphilis, and especially in vascular disease of the retina and choroid which is not amenable to other forms of treatment. As the latter are usually due to general vascular disturbance, the iodine preparations are given in ophthalmology with the same views and premises that obtain in other branches of medicine. The literature on this subject is so extensive that it is hard to examine it properly. Furthermore, as regards the action of iodine, there still are many conceptions based partly on personal experience and partly upon hypothesis. It seems worth while in this paper to give the results of experimental investigations on this question.

At first iodine treatment was purely empiric. Before the chemical nature of iodine was known, iodine preparations obtained from the ash of sea algi and sponges were officinal and frequently prescribed. The potassium salt of iodine belongs to the small number of old remedies which have retained their popularity, notwithstanding the large number of substitutes which have been suggested. The old medicine described the action of iodine as belonging to the group of alteratives. These were substances which stimulated the metabolism and nutrition of the body. The exact nature of their action was veiled in darkness. As exact changes in circulation, metabolism, and in the excretion could not be

determined, its unquestioned action was believed to be due to the influence of ferments and body fluid and other uncertain causes. As the effect of iodine is unquestioned clinically, the exact determination of its action is surely a thankful task for pharmacological investigation. Many authors in the last years have endeavored to solve these questions experimentally, and a considerable literature has accumulated.

The results obtained upon normal, healthy animals can hardly be transferred to explain conditions found in human ophthalmology. Furthermore, many results and views which have been found on investigation, do not confirm one another. A critical survey of the extensive literature, however, shows that there are a number of important and valuable facts to explain this question. As the action of iodine on certain organs or morbid processes must be regarded as a part symptom of its general action, a short description of the general effects of potassium iodide seems to be advisable as far as these investigations lead us to a better understanding of its special action in arteriosclerotic changes. Let us begin with observing the fate of the iodine combinations in the body.

THE DISTRIBUTION AND EXCRETION OF IODINE.

The distribution of iodine in the body has been examined by a number of investigators. According to O. Loeb, the distribution of potassium iodide in dogs and rabbits was the same in twelve experiments. The frequency and the method of administration did not influence the results. Most of the iodine was found in the thyroid gland, then in the blood or the skin; furthermore in the lungs, the glands, and the glandular organs. When the potassium iodide administration was stopped, the iodine was longest to be found in the thyroid gland, the blood, the lungs, and the kidneys. The observation of Loeb seems to me important, that the aorta contained about as much iodine as the liver, the breast, and the salivary gland. It seems that certain tissue elements of the vessels possess a definite affinity for iodine.

The action of iodine preparations on the eye has been also the subject of investigation. It has been shown that after

several cutaneous injections, or when taken by mouth, potassium iodide very rapidly in a few minutes appears in the ocular fluids, especially in the aqueous and in the vitreous.

The excretion of iodine is a rapid one, and begins a short time after it is administered, and after a few minutes it can be demonstrated in the saliva. The length of excretion of iodine in the form of potassium iodide has been investigated and a single dose of about 1*gm* is practically entirely excreted by the urine after a few days. The height of the excretion is reached in three hours after the administration and within twelve hours about $\frac{2}{3}$ of the iodine has left the body. After two or three days no trace of iodine can frequently be found in the urine. The larger the quantity administered, the longer is a part of the iodine retained in the body. Roux has shown that the elimination in repeated large doses can be extended for eleven days after the completion of a cure with iodide of potash. The length of excretion is influenced by a number of factors. It has been shown experimentally that the excretion is retarded by mixture with colloid, and increased by the addition of salt. Disturbances of the digestive tract lead to retarded elimination. The length of excretion depends naturally not only upon the size of the introduced dose, but also the number of individual doses.

The amount of iodine excreted in the urine in no case reaches the amount of iodine taken in. About 20 to 35% is not excreted by the kidneys and probably leaves the body by other ways of elimination. Very small quantities are lost through the intestinal tract. Symptoms of poisoning after the injections of iodine in ovarian cysts show that there is an excretion of the urine into the stomach. In these cases a large quantity of iodine was found in the vomit. Small quantities of iodine are found in the saliva, in the mucous secretions, in the tear fluids, and in the hair. Without doubt after long-continued iodine medication, deposits form in the body where the iodine is preserved and retained. This at present has been shown to be the case only for the hair. It is possible that a similar deposit will be found in the skin. The symptoms in iodism and the chronic poisoning with the appearance of the iodine acne suggest this.

THE SALINE ACTION OF POTASSIUM IODIDE.

Some of the effect of iodide of potash is unquestionably due to its saline action. It is a neutral, easily absorbable salt, which quickly penetrates into the tissues, where it exerts the many actions of salts. As a local irritant, potassium iodide may favorably influence functional disturbances, especially in the vessels, as well as in the body in general. Its action in ophthalmology when it is used in the form of drops and subconjunctival injections, can probably be explained in this manner. In judging of the particular action of iodide of potash on metabolism, we must remember the transformation of its components with sodium chloride and inorganic salts of the blood and the tissues. This exchange, according to the formula NaCl + Cj + CCl. + sodium iodide, takes place in two ways in iodide of potash where the potassium can not only replace the sodium but the halogen iodine and chlorine may exchange places. A distribution of ions takes place which must have some effect on the body in general. The new salts are partly excreted together with a part of the sodium chloride which appears in increased quantities in the urine. The administration of potassium may lead to loss of sodium chloride in the body. (Bunge.)

Resulting from the changed quantity of ions in the serum and blood cells, a peculiar symptom may arise, which consists in the iodide of potash reducing the viscosity of the blood. It is possible that reduced friction and a facilitated circulation of the blood may favorably influence disturbances of nutrition and vascular disease. This change in the blood must be of significance in the favorable action of iodine in arteriosclerosis.

Though iodide of potash may exert a pronounced saline action, its favorable effect upon some morbid processes can not be due only to this salt action, because the usual doses are very small compared to the resulting effects, and there is no other salt which is capable of replacing iodide of potash therapeutically.

It is therefore necessary to search for other causes for the action of the salt. These are probably to be found in the specific activity of its ions.

THE SPECIFIC ION ACTION OF POTASSIUM IODIDE.

It is surely not an accident that the potassium salt is preferred to the sodium one in treatment. Potassium salts in general diffuse more easily and penetrate the tissues quicker than do the sodium salts. The potassium salts, furthermore, have a greater action upon metabolism and renal function, so that the passage of water to the urine is greater and more prolonged. The favorable action of potassium iodide on disturbances of nutrition may be partly explained by the well-known diuretic attributes of the potassium salts. It is not possible to determine what other action the potassium ions exert. At the same time there can be no question that their action is much more intense than that of the sodium ions. The greater affinity of potassium to the tissues of the body is an important consideration, while the sodium contents of the body are more particularly found in the bodily fluids.

Of greater importance than the potassium action is unquestionably the specific action of the iodine.

It is to-day generally admitted that the cause of potassium iodide effect is due in the first place to the iodine ion—in other words, to the iodine which becomes free in the body. There are various views on the splitting up of the iodine in the body. According to Buchheim, the iodine is changed by oxygen in the blood and by ozone in the mucous membrane. According to Binz, the iodine is split up by the oxydizing action of the cell protoplasm in the presence of carbonic acid; while Sartisson lays greater stress upon the associated action of the nitrites in this connection. Rohmann and Malachowski are in favor of the last view.

Nitrites are found in the mucous membrane, in the sweat, saliva, pancreatic secretion, white brain substance, lung tissue, bronchi, parotids, duodenum, kidney, adrenals, testicles, and lymph glands. Sulphuric acid is found in combination in many parts of the body. Its production is the result of the reduction of the nitrates which are introduced into the body by the nutrition, especially when it is composed of vegetables and drinking water. There can be no question but that the body can reduce the nitrates. This conception is much more

probable than that the nitrate is formed by oxydation through the agency of ammonia and ammonia derivatives.

A splitting up of the potassium iodide in the body is furthermore shown by the characteristic symptoms on the part of the mucous membrane and the respiratory tract after continued administrations of iodides and in iodism. The symptoms obtained in experimental poisoning with iodine and with its alkaline combinations are also the same. Boehm and Berg injected intravenously iodine dissolved in sodium iodide into dogs, 40*mg* per *kg* of body weight. These animals succumbed at the same time and with similar symptoms to those in whom sodium iodide had been injected into the blood. After several hours a weak condition and respiratory disturbances set in, followed by death in from 12 to 24 hours. At autopsy there were blood-stained exudates and pulmonary œdema. In the kidneys there were characteristic hemorrhages situated in the medulla and the cortex, while the capsular spaces of the glomeruli were free from any trace of blood.

It is difficult to demonstrate the presence of hydriodic acid and of free iodine in certain organs, because these substances immediately enter into other combinations, particularly with albumen. In recent years considerable light has been thrown upon these reactions. According to the investigations of Pauly, the iodine proteids of the histidin and imidazol complex are regarded as the iodine containers. Tyrosin and tryptophan should also be considered in this connection. The old hypothesis of the origin of hydrogen iodine from potassium iodide in the body has some experimental basis, for Kulz was able to demonstrate free hydriodic acid in the stomach contents of dogs after the administration of iodide of potash. The hydriodic acid is an inconstant combination which is easily split up and liberates free iodine.

The action of free iodine on the body can be described briefly as follows. Like all halogens, it under certain conditions causes definite changes in the protoplasm, which are due to the unusual chemical reactability of these elements and show themselves according to the degree of irritation in inflammation, cauterization, destruction, or necrosis. Iodine is a protoplasmal poison. The effect is dependent upon the amount and concentration of the active substance and from the length

of its action. Iodine is supposed to act less intensively but more continuously than its associates. This is due possibly to the chemical affinity that iodine has for certain elements. All halogens attempt, like electro-negative ions, to unite in the body with the positive ions, especially with alkalies and hydrogen. Therefore their actions may be partly explained by a splitting of the water by which hydrogen is liberated and which is particularly energetic under these circumstances. The halogens furthermore easily enter into combination with albuminous material. It is necessary for the purpose of understanding the action of iodine to remember that the combinations of iodine with albumen are of a very sensitive nature. Boehm and Berg have shown that simple dialysis suffices to again split up the iodine into its ionized form, and coagulation exerts a similar function. Neutral solutions of albumen become distinctly acid from the addition of free iodine. This can be explained only by the production of free hydriodic acid. According to these authors, the combination of iodine and albumen follows simple apposition of the two bodies.

The ready combination of iodine with the body albumen suggests that metabolism must be influenced by iodine. It has not, however, been proven experimentally that free iodine exerts any action on metabolism unless it is in the form of a salt. At the same time, clinical experience has shown that long-continued administration of iodine has a distinct action upon the body, as is shown by the resulting emaciation and appearances of atrophy in the glandular organs, thyroid, and breast. The specific action of the iodine upon the glandular organs and upon the mucous membrane is undoubted. The loss of weight after iodine can with difficulty be explained as the result of disturbances in nutrition of the glands in the gastro-intestinal tract. In iodine therapy we may regard the first grade of the action on protoplasm to consist in nutritive irritation of the tissues and increase of the normal metabolism. An important rôle in this connection must be played by the augmented function of the thyroid gland, whose connection with metabolism is well known. This is probably especially true when functional disturbances of this gland already exist. This is also evidenced by the severe disturbances which follow

the careless use of iodine in hyperthyroidism and in the treatment of arteriosclerotic diseases, which are shown by emaciation, excitability, and other thyro-toxic conditions. There have recently been numerous clinical reports on the results of the misuse of iodine.

Certain chronic poisonings, for instance lead and mercury, are favorably influenced by iodine. In these cases there must be a change in metabolism. It is explained by the belief that iodine increases the excretion of certain metallic poisons. The experimental proof of a similar action in other infections and intoxications is more difficult. The chemical nature of these poisons is unknown and can not be recognized in the secretions. This holds particularly for syphilis and tuberculosis. It can not be doubted that syphilitic as well as tuberculous tissue-formations are caused to disappear and become absorbed by iodine. It is possible that iodine possesses a particular affinity for tissues which are pathologically changed. Loeb and Michaud have shown that tuberculous tissue retains and preserves larger quantities of iodine than normal tissue.

This proves that potassium iodide must have an action upon metabolism and that it can favorably influence arteriosclerotic changes. It is of interest to study the possibility of a direct action of iodine upon the vessels.

THE ACTION OF IODINE COMBINATIONS ON VESSELS.

In recent years a large number of specific vascular poisonings have been discovered which affect the permeability of the vessels, the pressure within the circulation, and the blood supply to the various organs. The most important of this group is adrenalin, whose action on the vessels is of the greatest physiologic importance. It is a component of normal blood serum and serves to preserve and regulate the normal vascular tone. It is uncertain whether its action depends upon a contraction of the muscular fibers of the heart and of the small arteries as well as the capillary walls, or whether it is due to an excitation of the sympathetic nerves. There can be no question that long-continued administration of adrenalin to animals (rabbits) produces remarkable changes in the aorta: dilatation, ectasias, and areas of calcification which resemble

arteriosclerotic changes. Similar changes have been produced by other substances, such as various organic extracts, acids, and salts.

Adler and Hensel observed necrotic lesions in the internal muscular layers of the aortic media after long-continued injections of nicotine into the ear vein of the rabbit. It is not without interest in the consideration of arteriosclerosis to see that alcohol, certain ingredients of wine, and caffein can be characterized by typical action on the blood-vessels.

It is not always easy to decide whether the severe anatomical changes in the vessels' walls are primarily pure toxic effects of the poisonous substances on the tissue elements, or whether they are secondarily the result of mechanical disturbances following increased blood pressure. In any case, the end effect is the same.

As far as we know, arteriosclerosis is the result of mechanical and chemical injuries to the arterial vascular system. Owing to the greatly impeded circulation, great demands are made on the elasticity of the vessel walls, so that necessarily organs which are not particularly resistant must give way. The degree of this distension and interference with the circulation must injure the elastic tissue. The well-known anatomic changes then occur, the elastic fibers become replaced by connective tissue, and the various degrees of degeneration, of calcification, and ulceration develop. In addition to the mechanical influences, considerable attention has recently been paid to chemical causes. That there is a toxic action upon the vessel wall is proven by the importance of poisons in the development of the characteristic symptom-complex of arteriosclerosis. The bad results of alcohol, tobacco, and other stimulants can not be denied. We also know that lead poisoning predisposes to arteriosclerosis, that the latter condition frequently develops after an infectious disease, which we then regard as a complicated intoxication and which appears in the form of arteriosclerotic degeneration of the heart and of the vessels.

What is the action of iodine upon the vessels?

Many authors deny that the iodides have a definite action on the vessels. Cushny believes that the favorable results of iodine therapy in arteriosclerosis is due to its antisyphilitic

action, because after the administration of iodine there are no changes to be observed in the action of the heart or in the blood pressure. It is of course difficult to determine the effect of minimal action on the vessels. After larger doses an influence on the blood-vessels can be demonstrated, according to Hedinger and Loeb. These authors injected in the course of eleven days 11g of iodide of potash subcutaneously in a rabbit. The rabbit was then killed by bleeding. At the autopsy the aorta was found dilated from the heart to the diaphragm, and there were externally visible numerous semicircular bluish ectasias larger than peas and which were probably aneurysms. The microscopic examination showed that these changes were limited to the media. They consisted in calcified and necrotic bands and areas, in which the elastic elements were absent or very much reduced or disintegrated. Surrounding these areas the elastic elements were separated and elongated. The wall of the aorta where this vessel was most distended was found to be reduced to ½ of its usual thickness. There were no changes to be found in the adventitia or intima. The vasa vasorum were also normal. In a second rabbit which was treated in the same way similar changes were found, consisting of aneurysmal dilatation and alterations in the media. Other experiments on rabbits proved negative. This observation is a very important one and shows that iodide of potash, like adrenalin, nicotine, and other poisons, may lead to vascular changes. It is probable that iodide of potash, like many other poisons, when in slight concentration exerts a nutritive stimulant to certain tissue elements. In larger doses it produces severe toxic changes. The pulmonary œdema which Boehm and Berg have observed after acute poisoning with iodine, is a toxic injury and the result of the increased permeability of the vessel wall.

Von Koranyi has drawn attention to the curious antagonism between adrenalin and iodine as to their action upon the vessels. With simultaneous administration of the iodine preparation (iodipin), it is possible, according to this author, to prevent the necrosis of the arteries which adrenalin produces. It is not possible to define exactly the action of iodine until we have more fully studied the nature of the arteriosclerotic vascular necroses.

There are other observations that make probable the action of iodine on the vascular system. The disappearance of the arterial pulse, the pallor and coldness of the skin of certain persons notwithstanding a vigorous heart action after poisoning with iodine, can not be explained except through changes in the patency or elasticity of the vessels. It seems that this action is rather due to a local influence of the vascular elements than to central causes. It is not possible in animals to demonstrate an increase of blood pressure by the injection of iodide of sodium. Iodide of potash, on the other hand, according to French authors, causes in dogs, after a temporary increase of vascular pressure, a long-continued uniform sinking of the pulse curve, combined with vascular dilatation. The action of iodide of potash in arteriosclerosis may consist in a relief of the heart action on account of less resistance in the vascular system, thus producing an improvement in the morbid process. Does iodide of potash influence the blood pressure in man as it does in dog? Unfortunately in the case of iodine it is with great difficulty that we can transfer the results of animal experimentation to man. Among animals even large differences are observed after poisoning with iodine.

SUMMARY.

The results of experimental investigations give the following deductions. Iodide of potash is characterized by a number of very definite actions. The first of these is its pronounced salt action, whereby it produces changes in osmotic processes and increased cellular activity in the body. Functional disturbances of all kinds can thus be favorably influenced and the best conditions are available for nutritive processes, for the absorption of food elements and the elimination of useless metabolic products. In addition to this salt action, the specific effect of the ions must be regarded. The action of potassium on the central nervous system and the muscles facilitates the transport of the salt in the bodily tissues and the exchange of ions, and the administration of potassium iodide causes peculiar changes in the mineral metabolism. In sodium chloride the sodium is replaced by the potassium and iodine takes the place of chlorine. In the hydrochloric acid of the

gastric juice an exchange of iodine for chlorine may take place with the formation of HI. Experimental investigations seem to show the possibility of the liberation of free iodine. As it is a uniform protoplasmal poison, it can influence all cellular functions.

The peculiar distribution of iodine in the body shows that it has a distinct affinity for certain tissues. The formation and the constitution of the iodine albumens are founded on exact chemical investigation. In the question of arteriosclerosis it is worthy of note that the arterial vessels as well as the glandular cells and many diseased tissues can collect iodine. It seems possible that therapeutic use of iodide of potash may not only influence metabolism but directly affect the vascular elements in arteriosclerosis. The reduction of the friction of the blood which iodide of potash produces may result in an improvement in the circulation and increased diapedesis.

As to the question of reduction of blood pressure with iodide of potash, there are at present only available exact measurements obtained from animals. Though experimental proof for the favorable action of iodide of potash on the vessels and on the blood pressure in arteriosclerosis is absent, we may assume from our knowledge of poisoning with iodine in man that the reduction of blood pressure must play a rôle in the action of iodide of potash.

Iodide of potash can not be replaced by any other salt or any other potassium combination or any one of the numerous modern substitutes. Its therapeutic effect must therefore depend upon three factors, the action of the salt, of the potassium, and of the iodine. Which of these is of the greatest importance it is at present not possible to say. Probably it is the iodine. There still remain many questions in our knowledge of the effect of iodine on arteriosclerotic changes. The existing difficulties may be explained by the statement that pharmacologically the chapter on the action of iodine is as incomplete as the knowledge of arteriosclerosis is in a clinical or pathological sense.

REPORT OF THE TRANSACTIONS OF THE SECTION ON OPHTHALMOLOGY OF THE NEW YORK ACADEMY OF MEDICINE.

By Dr. GEORGE H. BELL, Secretary.

DR. H. H. TYSON, CHAIRMAN. MONDAY EVENING, MARCH 16, 1914.

Dr. J. Bruder presented a case of changes in the macula following **solar retinitis.** After being exposed to the sun on June 20, 1913, for more than six hours, he noticed a sudden obscuration of his vision in both eyes and sensation of sparks and balls of fire before his left eye. Two days later the patient complained of distortion of objects, persistence of after-images and balls of fire, and macropsia. Examination of his field showed a positive central scotoma. Vision, O. D. $\frac{20}{40}$; O. S. $\frac{20}{200}$. Ophthalmoscopic examination revealed a fine striated hemorrhage in the macular region. These hemorrhages persisted for more than three months, when they gradually disappeared. With the disappearance of the hemorrhages his vision gradually improved, until the 28th of October, when his vision was $\frac{20}{30}$ with correction. The after-images, as well as the positive scotoma, still persist. Wassermann negative. Urine negative. Tuberculin 2 injections, 1 of 1*mg*. T. O., and another of 2*mg* 3 days later, failed to show any reaction. Diagnosis: solar retinitis.

Dr. Bruder presented a case of **colloid degeneration of the choroid** (sometimes called verrucæ laminæ vitreæ). The patient, age 50 years, complained of disturbance of vision and of spots before his eyes. Vision, O. D. $\frac{20}{30}$; O. S. $\frac{20}{40}$. Ophthalmoscopic examination showed large floating vitreous opacities in both eyes. Details of fundus could not be seen distinctly owing to these opacities. After treating him for three weeks,

the opacities cleared up, disclosing white glistening bodies or dots, situated in the choroid, and which in the author's opinion are colloid excrescences. Vision, O. D. $\frac{20}{20}$; O. S. $\frac{20}{20}$.

Dr. DUANE, in discussing Dr. Bruder's first case said that he had seen a number of cases of solar retinitis, but had never seen any macular changes.

Dr. BELL presented a case of **cyst of the retina.** The cyst was pear- or bladder-shaped. It was about 5*mm* long and 2*mm* wide, and projected out into the vitreous about 2½*mm*. It was situated below and to the inner side of the disk. There are some chorioretinal changes below and to the inner side of cyst, probably of hemorrhagic origin. There are no blood-vessels in the mass. Fundus clear. Vision, with correction, $\frac{20}{20}$.

Dr. WEIDLER, thought it might be retinitis proliferans.

Dr. DUANE said that he had seen a congenital cyst of the retina, but it did not look like this case. In the case he saw the eye was blind.

Dr. SCHOENBERG suggested a cyst of the retina.

Dr. BELL, in closing the discussion, said he did not think it was a case of retinitis proliferans, as there were no blood-vessels on the cyst and there was not enough disturbance in the vitreous.

Dr. WOOTTON presented a case of **bilateral glioma.** The patient was a child, two years of age. Two months ago the parents had noticed a white reflex from both pupils. In both eyes a yellow-white tumor was visible in the fundus, with vessels upon its surface. The retinæ were only partially detached and the child unquestionably still possessed vision. On this account, it was proposed to enucleate first one eye, the enucleation of the second to follow the confirmation of the diagnosis microscopically. Tension in each eye was apparently increased. It was certainly not diminished and there were no evidences of iritic inflammation. There was no history of antecedent illness.

Dr. WOOTTON also presented a case resembling the picture of **"embolus" of the central artery,** following injury to the globe. The patient, a boy 14 years of age, had been struck in the left eye with a piece of ice on February 17th. When seen, two days later, there were swelling and ecchymosis of the lids,

subconjunctival hemorrhages, and proptosis. An examination of the fundus was not obtained until seven days after the injury. During this interval there seems to have been some doubt as to whether light perception existed, but it was abolished at the time of the fundus examination and had not existed since, consensual reaction of the right pupil being persistently absent. The fundus at first exhibited circumpapillary œdema, extending from the disk to beyond the macula. The situation of the macula was marked by a "cherry-red" spot, elliptical in shape, with its long axis horizontal. There were several small hemorrhages near the macula, and the veins in this region were rendered abnormally distinct by the œdema. There was marked ischæmia of the retina, the arteries being reduced to mere threads. Later, the vessels began to refill, and on March 9th both arteries and veins were about normal in size. A week later, when the case was exhibited, the retinal œdema was much less marked, but the red spot in the macula and the hemorrhages in its neighborhood still persisted. Proptosis, which was well marked in the beginning, disappeared gradually in about three weeks. An X-ray of the orbit revealed nothing. The heart was normal, the blood pressure 115, and the Wassermann and Pirquet reactions negative. The fundus picture resembled that following section of the optic nerve after its entry by the retinal vessels, but it seems impossible that such a lesion should follow the injury described unless a fracture in the orbit had resulted, and this, if it existed, the X-ray had failed to show.

Dr. WEIDLER has observed a similar case. There was an œdema of the macula as in this case, no vision, and optic atrophy.

Dr. L. EMERSON thought there might have been a sharp foreign body in the snow-ball.

Dr. EMERSON presented a case of **orbital periostitis.** Exophthalmus. Gave history of ptosis. Had had syphilis. Fundus normal. Vision normal. Sinuses clear. No X-ray. Had not had iodides on account of violent skin reaction.

Dr. DUANE suggested red iodide of Hg.

Dr. TYSON thought that K I would do well.

Dr. COHEN considered the possibility of some vascular disturbance, on account of the enlarged veins.

Dr. WOOTTON suggested a tumor of the muscles.

Dr. DUANE presented a new model **tangent plane** with cards adapted for plotting scotomata and field of double vision. Instrument is to be used two standard distances, 30 in. and 60 in., and for each distance a separate set of cards is designed. Both screens and cards are so planned as to be applicable equally for those who use the inch or the metric system.

Dr. LAZINSKI asked if he used this instrument for taking field of vision?

Dr. DUANE said it could be used for that, but he preferred the perimeter.

Dr. SCHOENBERG and Mr. BIRCHELL presented four rabbits to show two different types of **experimental ocular tuberculosis.** (To be published in full in the next issue.)

Dr. WEIDLER said these results are extremely interesting. Whenever he gets a positive Pirquet in conjunctivitis, iritis, or choroiditis he always uses tuberculin. In some cases where we have marginal keratitis, when it recurs, he used tuberculin if Pirquet was positive. He cited a case of a little child where the keratitis had gone on for three months until T. R. was used.

Dr. SCHOENBERG thinks Pirquet is absolutely valueless. You cannot make a diagnosis in the eye from the Pirquet test.

Mr. C. M. ABBOTT, Secretary of the Commission for the Blind, said: "The New York State Commission for the Blind is the official recognition on the part of the State Government of the necessity for providing adequate aid for the 6500 blind in the State. The two State schools for the blind do not receive pupils after the age of 21, and as it is estimated that 75% of the blind become so after the age of 21, it is manifest that some special aid must be given to them.

"The Commission has very broad powers. It has in its possession a register of the blind in the State of New York which is fairly accurate and shows that, roughly speaking, 2700 blind are in the city of New York, while the remainder are in the up-State counties. In its New York office the Commission maintains a Bureau of Information and Industrial Aid for the Blind, and has designated the New York Association for the Blind, the Buffalo Association for the Blind, the Albany

Association for the Blind, and the Rochester Association of Workers for the Blind, as bureaus of information and industrial aid of the Commission, thus establishing definite co-operation. Although the Commission has the power to establish schools of industrial training and workshops, its present appropriation is not sufficient for this purpose, but it is looking forward toward the establishment of a trade training school for adult blind from which they can be graduated after learning their trades and become wholly or partially self-supporting in their home communities. The Commission is laying much emphasis upon the home teaching of the adult blind, which consists of arousing their interest, instructing them in the performance of household duties and in the making of useful and salable articles. Home teaching is best when conducted by blind or partially-sighted teachers.

"The Commission has the authority to inaugurate and co-operate in measures for the prevention of blindness, and in this matter it is working in conjunction with the Committee for the Prevention of Blindness and will be able through its official connection to lay emphasis upon the necessity of this phase of its work.

"The Commission is anxious to secure prompt and full advices concerning those who lose their sight and the death of blind persons, in order that its register may be kept accurate."

The members of the Section were asked to suggest methods by which this may be accomplished without making special difficulty. The Section was asked to consider whether it would be well to make such reports to the Commission and the Commission could then send reports to the New York Association for the Blind and to the Committee for the Prevention of Blindness. A definite request will be made of the Section in regard to this matter when it has been further considered by the Secretary of the Commission and representatives of the New York Association for the Blind and the Committee for the Prevention of Blindness.

Dr. GEHRUNG said it is a known fact that the ophthalmologist seldom sees a case go to blindness. As soon as that prognosis is made, the patient goes either to others or in despair seeks seclusion until an absolute burden on friends, and then goes to an asylum. Accordingly, I would suggest that as soon

as a diagnosis is made in which blindness is the probable outcome, a central bureau should be notified and they take the necessary steps to teach the patient some useful occupation. This would be much easier while a little vision remains and would lessen the despondency.

REPORT OF THE TRANSACTIONS OF THE OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

ANNUAL CONGRESS.

By Mr. C. DEVEREUX MARSHALL, F.R.C.S., London.

The Annual Congress of the Ophthalmological Society was held at the rooms of the Royal Society of Medicine, Wimpole St., on Thursday, Friday, and Saturday, April 23d–25th, while a clinical meeting was held at the Central London Ophthalmic Hospital, Judd St., W. C., on Friday afternoon.

The Chair was occupied by Mr. F. Richardson Cross, of Clifton, Bristol, and among the distinguished visitors were Professor Uhthoff, of Breslau, Professor Straub, and Dr. Landolt, of Paris.

The President, in the course of a short introductory address, reminded members of the distinguished work of his predecessors in the Chair—Bowman, Hutchinson, Hulke, Hughlings Jackson, Argyll-Robertson, Berry, Sir Henry Swanzy, David Little, Priestley Smith, Nettleship, Tweedy, and Lawford—and expressed congratulation on behalf of the Society to the Royal Society of Medicine on the success achieved by the Section on Ophthalmology. He referred to his investigations on the question of factory lighting, undertaken at the request of the Royal College of Surgeons, and thanked members for the help they had given him on the subject. Most of the replies, however, from members who practised in industrial localities, showed that there were few ailments which could be attributed to the insufficient or bad lighting of factories; but the inquiry did not include such special work as glass-making, or working on red-hot or white-hot conditions of

metal, testing arc lamps, etc. Any injury done by excessive artificial lighting seemed to be attributable to the ultra-violet rays, as in the case of snow-blindness; but the wearing of any glasses largely protected the eyes from the ultra-violet rays. The negative results of this inquiry did not lessen the necessity for aiming at a perfect form of lighting, which was an economic question concerning not only the best results of work, but the hygiene of vision. There still remained much to be learned as to the causation and treatment of eye diseases. All kinds of abnormal conditions of blood and system generally might set up inflammation of the intraocular blood-vessels, such as iritis, uveitis, episcleritis, retinitis, etc. He referred to the suggestion of Mr. Basil Hughes that instead of rheumatic iritis the term "metastatic iritis" should be used. It was very necessary to determine the ætiological cause of the condition seen, for then measures could be taken to increase the patient's resistance to the particular organism, and of course any focus of disease must be energetically treated. He proceeded to speak of the selection shown by certain bacteria for particular localities; and said there was reason to believe that bacteria flourishing in their own particular locality might produce different strains showing a selection for other tissues. The view that there were evolutionary developments of bacteria seemed well justified. He also referred to the value of diphtheria antitoxin and the various hormones in ophthalmic work, as also the serum therapy which was so well initiated by Sir Almroth Wright. He spoke of the gonococcus being the most widespread cause of infectious diseases, and pointed out that the organism might remain latent in the body for years. He referred to the work of Carl Browning showing the close relationship between syphilis and interstitial keratitis, and primary optic atrophy, general paralysis of the insane, and locomotor ataxy, while half of the cases of iritis and one fourth of the cases of choroiditis were shown to be syphilitic. The good effects of salvarsan and neo-salvarsan in eye disease, he said, were very marked.

Dealing with the history of the Ophthalmological Society, the President reminded members that in 1880 a committee was appointed to consider defects of sight in relation to the public safety, with authority to communicate thereupon with

the Government on the part of the Society if thought fit. In the following year an International Committee, fourteen nations being represented, was appointed "to deliberate concerning the tests of vision and color sense most applicable to persons employed in working or observing signals by land or sea when the lives of others are involved." In the 2d Vol. of the Society's *Transactions* appear the resolutions arrived at, indicating how unsatisfactory the matter was at that time. If the advice tendered thirty years ago had been taken advantage of, many disasters would have been prevented. The Society also took an important step in 1884 in connection with the prevention of blindness from ophthalmia neonatorum, and a Special Committee appointed brought forward certain resolutions, which were adopted. But the Local Government Board, Whitehall, declined to act on the suggestion that printed instructions as to the dangers should be handed to each person registering a birth, and despite several attempts it had not yet been possible to bring this about, notwithstanding the large number of cases of blindness due to this cause. But quite recently, discretion was given to Town Councils and County Councils to make the disease notifiable if they thought fit, and now ophthalmia in infants had become notifiable. It was, said the President, terrible to reflect on the number of people whose sight might have been saved if adequate measures had been taken so long ago.

Mr. W. H. H. JESSOP read a paper entitled **The prognosis in incipient cortical opacities of the lens.**

Sir ANDERSON CRITCHETT, Bart., expressed his agreement with Mr. Jessop's remarks and related the case of a clergyman, æt. 48, who, when he consulted a young oculist, was told he had cataract, and he was so nervous in consequence that he insisted on presenting himself for examination every few months, fearing that he would be losing his sight. But his sight continued good, except for a slowly progressing presbyopia, until he was 86.

Professor LANDOLT, Paris, agreed that cases such as those described by Mr. Jessop were often met with, and he thought the term cataract should be restricted to cases in which there was serious impairment of vision and finally required removal of the lens.

Mr. J. B. STORY, Dublin, also expressed agreement, and suggested that the term cataract should not be used when, in the opinion of the observer, the condition was not progressive.

Mr. LESLIE PATON described cases similar to those related by the author, and Dr. G. F. ALEXANDER thought that the fine spicules often seen in the eyes of young people were congenital and had persisted throughout life.

Mr. JOHNSON TAYLOR, Norwich, also described such a case in which he was able to prevent a fruitless operation for a condition which was not progressive nor detrimental to the sight.

Dr. GEO. MACKAY, Edinburgh, Mr. ROWAN, Glasgow, Mr. C. WRAY, Croydon, also discussed the paper, and Mr. JESSOP replied.

Mr. BISHOP HARMAN (London) read a paper entitled **The appearance of pigment in the iris of the child.** The observations were made on white children, the offspring of a blue-eyed, fair-haired father and a brown-eyed, dark-haired mother. At birth in each case the irides were of the usual dull slaty-blue color; the iris tissues were obscured as though coated in some smooth fine-textured material. Clearing of the iris stroma was noted from the third to the sixth week of life. The two children developed blue eyes, one blue with the suggestion of violet, due to rims of finer, darker stroma at the margins. The other blue became bright and cold in tint, owing to a marked thickening of the stroma in the intermediate zone. Two children developed brown irides. The first sign of brown pigment was noted at the sixth week. The pigment was in broad irregular patches extending from the basal margin; it looked just as though the iris had been touched with brown ink which was soaking through to the surface and towards the pupillary border. The development was earliest in the temporal half of the iris. The patches extended and fused until the whole was brown. The tint became full and pure in one child; in the other there remained at the age of two years some suggestion of bluish or greenish tint at the depth of the crypts of the iris. In none of these cases was there any of the fine scattered pigment that is so common a feature of the hazel and dirty blue irides, and which forms an irregular ring about the pupil-

lary margin. From a few observations it was thought that this surface pigment spread from the pupillary margin at a later date, and from a secondary pigmentation.

Dr. GORDON HOLMES and Mr. R. A. GREEVES read a paper on **flat sarcoma of the choroid, with multiple metastases.** It was a case in which the trouble commenced with external rectus palsy, and later there was severe pain in the right forehead, and examination revealed considerable sensory loss in the distribution of the first division of the right trigeminal nerve. Still later there was complete loss of tactile sensibility, and partial palsy of all external muscles innervated by the right oculomotor nerve. The pupils, however, continued to react well to light, but he subsequently developed marked optic neuritis. Death occurred five and a half years after the commencement of the symptoms.

Mr. LESLIE PATON discussed the case.

Mr. R. A. GREEVES read a paper on **two cases of microphthalmia,** and Mr. LESLIE PATON one on **papillœdema in disseminated sclerosis.** The author found in 100 cases, 5 which showed evidence of past neuritis. In one case, eighteen months after the optic neuritis had been present in one eye, there were normal fundi without atrophy and with normal visual fields, vision being $\frac{6}{6}$ in one eye and $\frac{6}{9}$ in the other. He related a number of cases supporting his thesis.

Lieut.-Colonel R. H. ELLIOT read a communication on **dressings and antiseptic methods in ocular operations.** The paper was concerned with attention to minute details to ensure scrupulous cleanliness in operations, and incidentally the author criticized some thoughtless procedures which he had seen in some clinics. Referring to the recommendation of Colonel Herbert for irrigation of the conjunctiva with 1 in 3000 perchloride, he said that since 1907 he, Colonel Elliot, had not had one case of post-operative panophthalmitis.

Professor LANDOLT (Paris), in discussing the paper, expressed the opinion that boiling cutting instruments spoiled the cutting edge, an important matter seeing that a clean-cut wound was very much more satisfactory than one which was not made with a very sharp instrument. He therefore used and recommended dry heat, viz. up to 150° F., keeping the instrument in that for twenty minutes. He believed he had never had a

case of infection from instruments. His practice was, when using atropine, to use a fresh ampulla each time. He objected to an irrigator.

Mr. W. H. JESSOP referred to the danger of using long india-rubber tubes in connection with operations; several which were bacteriologically examined at a large hospital were found to be teeming with micro-organisms.

Professor STRAUB pointed out that most of the infections at operations arose from the spread of organisms which were already resident in the eye. His practice was to carry out the sterilizing and cleansing procedure on the patient for three days before operating.

Mr. C. WRAY read a paper on **the treating of dislocated lens.** He said he did not consider needling was a form of treatment of dislocated lens. If the lens were very much displaced, iridectomy might be the right thing to do, but he did not think it was generally sufficiently displaced to justify that procedure. If the natural tendency of the lens was to become dislocated, he did not hesitate to do couching.

The paper was discussed by Professor LANDOLT, Mr. J. B. STORY, Mr. PRIESTLEY SMITH, Lieut.-Colonel ELLIOT, Mr. ROWAN, Professor STRAUB, and Mr. GRAY CLEGG.

Friday morning was devoted to the subject of **post-operative complications of cataract extraction.** The discussion was opened by Mr. TREACHER COLLINS and he treated it chiefly from the pathological point of view. He first of all called attention to the difference noticed in the healing of extraction wounds after the different forms of incision made by different operators, and he described how some incisions healed much better than others. He greatly favored the incision which aimed at the cutting of a conjunctival flap. If the wound did not heal readily it was possible for a down growth of epithelium to take place, and this might spread over the whole of the anterior chamber, and be the cause of blocking of the angle of the anterior chamber, and thus of causing a condition of glaucoma. He discussed the effect of delayed union of the posterior lip of the wound, and the cause of striated opacities of the cornea after extraction. Prolapse of the iris, causing a bulging cystoid scar, sometimes led to a late suppurative condition of the uveal tract, which might occur months or even years after the healing

of the wound. Astigmatism varied enormously in amount after extraction, and largely depended on the healing of the wound and the way in which the flap was in apposition. Suppurative inflammation of the cornea was most often caused by the pneumococcus, but the frequency of this had been greatly diminished by aseptic precautions, as sterilization of instruments. Thus in a series of Moorfield's cases published in 1876 the percentage of eyes lost from this cause was 6.2. In another series published in 1894 it was 1.7, and in Mr. Collins's own cases done between 1900 and 1912 it was 1.15%. No sterilization of instruments was done at this hospital previous to 1883. He advocated the use of the galvano-cautery in such cases, and he had also seen good results follow the use of vaccines, but as other local treatment was always carried out it was difficult to say how much good really resulted from the injections. In some cases posterior synechiæ developed in quite quiet eyes, and these he did not look upon as being septic; in like manner "keratitis punctata," which was certainly non-septic, could often be found in cases running a normal course if these dots were really looked for. He thought it quite a fallacy to think that the mere presence of soft lens matter in the anterior chamber was capable of producing iritis, but when it was mixed with aqueous it certainly formed a very good nutrient medium for the growth of organisms if any were allowed to be present. With regard to the development of sympathetic ophthalmitis he had seen several cases which had greatly benefited by the use of salvarsan, and he also alluded to the information to be derived in dangerous cases by having a blood count done. He discussed in detail the way in which glaucoma was produced after an extraction or a needling of capsule, and the ways of treating them. He finally dealt with expulsive hemorrhage, detachment of the choroid, opaque membranes, vitreous opacities, and detachment of the retina.

Lieut.-Col. H. HERBERT dealt with the subject from the clinical side. He said that the most serious after-complication of cataract extraction was that due to infection. He strongly advocated the very thorough irrigation of the conjunctiva with perchloride of mercury, and gave statistics showing how that in India suppuration became all but unknown after this was carried out in a thorough and systematic manner. The

usual strength was 1 in 3000. This certainly had the drawback that it did irritate the conjunctiva and subsequently led to a further development of micro-organisms than would otherwise have been the case, but by this time the wound had healed; however it should be taken into consideration if it were contemplated to do a further operation within the first two weeks, such as a very early needling. He was strongly in favor of making a large conjunctival flap with the original incision for the extraction.

Sir ANDERSON CRITCHETT, Bart., considered that Mr. Treacher Collins had placed upon a firm pathological ground questions upon which the profession was previously in a condition of uncertainty. He described what he considered to be the best procedure in complicated cases of cataract where the pupil had been drawn up into the wound, or where there was a dense capsular membrane. No class of case required greater experience, and he discouraged the slightest empiricism, advocating eclecticism, adopting the procedure found suitable to each particular case.

Mr. CARL BROWNING read an interesting communication on the subject, in which he said that out of hundreds of cases examined at Moorfield's Hospital before the cataract operation, only one case was pronounced bacteriologically clean which subsequently became infected after operation. Three of the 14 unsatisfactory cases during the last four years had been in eyes which had been reported unfit for operation but were nevertheless operated upon. All these eyes were lost. Some of the chronic cases of low virulence responded to vaccine treatment; some yielded to salvarsan or neo-salvarsan. He suggested that causes for sepsis should be searched for further afield than in the eye itself, viz., in the gums, nose, throat, etc. Many of the infections he had found to be endogenous, not arising in the conjunctival or lacrimal sac. The practice of bandaging the eye for twenty-four hours previous to operation and deciding whether the eye was fit for operation by the comparative absence of pus on the bandage he considered to be bad from a bacteriological point of view, for in several cases examined carefully the organisms present had increased during the time the bandage was in position, and some forms of virulent organisms were present after the bandaging which had not been detected before.

Mr. C. KILLICK described his results in 101 serial cases, one of which suppurated. During three years in his own practice he had had only 3 cases of suppuration after cataract extraction out of 1000 cases. One eye in each of these 3 cases was restored to sight. He also described the varieties of after-cataract, and said he had had to needle twenty-eight times in all his cases, for capsular proliferation.

Mr. C. WORTH spoke of hemorrhage occurring into the anterior chamber five days after the operation, and he regarded that as peculiar to the operation with the conjunctival flap; he had not seen it where the incision had been corneal, and it probably occurred after some movement on the part of the patient, not necessarily a blow. This hemorrhage retarded convalescence. He had adopted a conjunctival flap in all cases and keeping the patient quietly in bed for a longer time than for the corneal incision. He also spoke of the accident of vitreous coming forward into the anterior chamber through the discission of the membrane. At the time of the extraction he always divided the capsule straight across; he made no attempt at the V-shaped opening, so that in most of the cases there was an anterior capsule left in the line of the pupil.

Mr. A. W. ORMOND read notes of two cases in which post-operative complications occurred after removal of lens. Both were endogenous infections.

Mr. J. B. STORY (Dublin) said he had been able to assist some cases of wound infection by the application of the electro-cautery to the edges of the wound and by a subconjunctival injection of cyanide of mercury. He believed in the majority of cases of inflammation after cataract extraction it was an exogenous infection, and it had long been his practice before operation to make careful examination not only of the eye but also of the nose and mouth. If there were many organisms, operation was deferred, and the patient submitted to a cleansing and fortifying treatment.

Mr. G. F. ALEXANDER spoke of the great instruction he had received from operating in Lieut.-Col. Elliot's clinique at Madras, and related some of the impressions he had derived from the wealth of material available therein.

Lieut.-Colonel ELLIOT spoke in high praise of Mr. Collins's

contribution to this subject, and declared that there was no ophthalmologist for whose work the younger workers in India had a more profound admiration than for that of this authority. He also thanked him for the generous terms in which he had acknowledged Colonel Herbert's valuable work in the same direction. He, the speaker, had himself worked hard for a number of years on the subject of post-operative astigmatism, and Mr. Collins's present paper had been most valuable to him. He supported Mr. Collins's remarks about the influence of traumatism on the appearance of post-operative opacities. Where there was a large lens which had to be delivered through a tight wound there was apt to be striated keratitis. For non-inflammatory cataract he used two needles. For inflammatory cataract he used the knife, and if that failed he opened the chamber. He did not cut the capsule but cut the healthy iris.

Professor LANDOLT expressed his great satisfaction with the contributions of the openers, and said his experience had led him to the same conclusions. One of the most dreaded complications, apart from sepsis, was prolapse of the iris. To avoid this he always performed iridectomy with the cataract extraction, exercising the iris widely, often in two cuts, so that after the section it retracted by its own elasticity. If part of the iris were entangled in the scar he would cauterize it with the galvano-cautery, afterwards covering with a flap of conjunctiva. He had always been sceptical as to the use of preliminary bandaging. And he proceeded on the assumption that no conjunctival sac was free from pathogenic germs. Moreover, danger of infection persisted so long as the wound remained open. He pictured it as a race between the development of noxious germs and the closure of the wound. If the eye were tied up twenty-four hours before operation, the development of these germs was favored, and the patient's recovery handicapped. He did not agree with the use of strong antiseptics for cleansing afterwards, though in conjunctivitis he would use even nitrate of silver. He showed his forceps for the purpose of dealing with secondary cataract.

Mr. G. MACKAY (Edinburgh) asked whether some weaker preparation than 1 in 3000 perchloride would not do. He had given up strong solutions because of the frequency of posterior corneal opacities. His preparation of the patient consisted of

regular douching of the conjunctiva with sterile saline or boric lotion. In this connection argyrol was also useful, employed two or three times a day.

Professor UHTHOFF (Breslau) also described his methods and experiences in the operation, and was followed by Mr. THOMSON HENDERSON.

Professor STRAUB spoke of the chronic inflammation which commenced in the second week after operation, and said he had not seen this occur when the toilet after the operation had been well and carefully done. He also detailed his method for preventing squeezing of the eye, this squeezing sometimes accounting for the loss of the eye.

The President said all realized that the essential necessity was the production of absolute local asepsis, or antisepsis, the most rigorous cleanliness of instruments, patient, and person. Most of the cases of sepsis he regarded as exogenous, but there were cases of endogenous infection. Cases such as Mr. Ormond related he considered to be gouty, using that term in its generic sense. He referred to the possibility of sepsis from the teeth, and from metastatic inflammation. He related some cases. The openers of the discussion briefly replied.

On Friday afternoon a clinical meeting was held at the Central London Ophthalmic Hospital, when the following cases were demonstrated and discussed:

Mr. F. A. JULER: (1) **Hyaline bodies on the optic disk.** (2) **Congenital ophthalmoplegia.**

Mr. LESLIE PATON: **Congenital malformation of the disk.**

Mr. M. S. MAYOU: (1) **Tuberculous mass in the optic nerve sheath.** (2) **Inflammatory or congenital mass around the nerve.**

Mr. CECIL GRAHAM and Mr. LESLIE PATON: Cases of **West's operation for lacrimal obstruction.**

Mr. TREACHER COLLINS: **Concussion injury with rupture extending across the optic disk.**

Mr. C. WRAY: (1) Colored drawing of the **rare cases of corneal disease** shown at the last meeting. (2) Two cases of **ectopia lentis.** (3) Case of **intraorbital neoplasm.** (4) **Lenticonus.** (5) Case of **6 D of hypermetropic astigmatism cured by the cautery.** Vision $\frac{6}{6}$.

Mr. SYDNEY STEPHENSON: Case of **sympathetic ophthalmitis treated by six injections of neo-salvarsan.**

Mr. R. R. JAMES: (1) **Massive tubercle of the iris.** (2) **Crater-like hole at the disk, with macular changes.**

Mr. G. COATS: **Congenital partial paralysis of the oculomotor nerve, with cyclical contraction and dilatation of the pupil.**

Mr. G. COATS showed and described a case of **congenital partial paralysis of the oculomotor nerve, with cyclical contraction and dilatation of the pupil.** The condition was observed in the left eye of a girl aged 10, and had been present since birth. The signs of oculomotor paralysis were: partial ptosis, divergence, abolition of upward, and limitation of inward and downward movement. The cycle of pupillary phenomena consisted of relatively rapid contraction, followed by a more gradual dilatation. The movements were not strictly rhythmical, and movement of the eye to the right, whether on convergence or conjugately, tended to induce contraction and render the phase of dilatation more intermittent and less complete; relaxation of the internal rectus had the opposite effect; but the play of the pupil continued even when the adducted or abducted position was continuously maintained. During contraction, the pupil was immobile; during dilatation, it responded to light and consensually. In ordinary circumstances the stage of miosis was accompanied by a contraction of the ciliary muscle and by slight raising of the lid. The eye was astigmatic and amblyopic, the other being slightly hypermetropic. Some 19 cases of this affection had been recorded, most of them in recent years. Characteristic of the group was a partial third nerve paralysis, usually but not always congenital, and interrupted by periods of activity in the internal rectus, levator palpebræ, sphincter pupillæ, and ciliary muscle. The suggested explanation of Salus was stated and discussed—that during the repair of a lesion of the third nerve some of the axis cylinders sprouting from the central end made a kind of "false junction," and so connected a given nerve center with a muscle or group of muscles not belonging to it. If, for instance, all the fibers which should go to the internal rectus were diverted to the sphincter, then an effort at adduction would result only in a contraction of the pupil, and a partial side tracking of these

fibers would produce partial phenomena of the same nature. This hypothesis, however, did not readily explain why the false junction should invariably take place between the internal rectus fibers (occasionally *also* the inferior and superior and inferior rectus fibers) and the pupillary and levator fibers—why, for instance, the attempt to look inwards was never associated with a movement upwards of the globe; something a little more haphazard might be expected in the case of nerve fibers finding their way at random through a mass of inflammatory material.

On Saturday morning Mr. THOMAS HENDERSON demonstrated and described a pressure gauge which he had devised for measuring changes in tension instead of the digital pressure in order to test the intraocular tension.

Mr. C. B. GOULDEN read an instructive paper on **Optic neuritis and spinal myelitis,** describing a number of cases which illustrated the usual progress of the disease. The paper was discussed by Mr. J. B. LAWFORD, who described a case in 1884, and he remarked that the profession remained as ill-informed as to the causation of the disease as thirty years ago. He hoped a similarly careful investigation of future cases would be made as that by Mr. Goulden.

Dr. GORDON HOLMES related three cases of the condition, one of which recovered completely. In the cases which he had examined *post mortem* the most extensive lesion was in the chiasma or in the optic nerve. There was considerable disintegration of nervous substance. Axis cylinders remained practically intact. The actual infecting agent was not yet known.

Mr. BROOKSBANK JAMES read a paper on **Irido-sclerotomy in glaucoma.** Having referred to previous communications on the subject he described the operation he adopted. A large conjunctival flap was turned down well over the corneal margin consisting only of the superficial part of that structure. An incision was then made transversely close up to the reflected conjunctiva, being about 1*mm* within the limbus. A second incision was commenced at one extremity of the first and, diverging somewhat, finished close to the other extremity and including about ½ or ¾*mm* of scleral tissue at this

extremity of the incision. The anterior chamber was then opened by deepening the central portion of the first incision. After the aqueous had slowly escaped, the incision was enlarged to its extremities. A repositor being used to free the flap from any deep attachments, it, the flap, is separated through the length of the wound and turned outwards. A medium-sized iridectomy was then performed and the conjunctival flap was replaced. He claimed for the operation that the conjunctival flap was a great safeguard and was necessary to allow of filtration. The opening in the sclera was a chink instead of a hole and facilitated the escape of fluid all along the wound. The iridectomy was always satisfactory and he had never known impaction of the iris tissue. The safety of the operation was due to the position of the incision and to the fact that the aqueous escaped very slowly. Having compared the results of his operation with trephining, he far preferred the operation he had described for the permanent relief of tension. He showed some of his cases illustrating the method.

Dr. C. O. HAWTHORNE showed a number of perimeter charts taken from cases in which **homonymous hemianopia** was the principal or only evidence of intracranial disease. In his first group he placed cases of cardio-vascular degeneration with or without renal disease, the hemianopia here being due presumably to arterial obstruction or rupture. In a second group were described cases of homonymous hemianopia occurring in young women free from all evidences of cardio-vascular or renal disease but the subjects of anæmia or chlorosis; and in these cases it was argued that the hemianopia was probably due to venous or sinus thrombosis within the skull. Rarely a similar condition develops in epilepsy, and here also it may be possible to hold that sustained arterial spasm may lead to capillary and venous thrombosis, which, occurring in the visual tract posterior to the optic commissure, would be sufficient to account for the homonymous hemianopia.

The paper was discussed by Mr. BROOKSBANK JAMES, Mr. LEIGHTON DAVIES, Dr. G. F. ALEXANDER, Professor LANDOLT, Professor UHTHOFF, and the President, and Dr. HAWTHORNE replied.

Mr. M. S. MAYOU read a communication entitled **Diseases**

of the eye in animals, and it was illustrated by a number of photographs.

Mr. J. GRAY CLEGG read a paper on a case of **senile cataract with two nuclei.** In 1904 Mr. Gray Clegg saw a male patient, æt. about 70, who was suffering from a senile cataract. The ordinary method of extraction with iridectomy was adopted. After rupturing the lens capsule with a cystotome, he expressed the lens, when a dark brown nucleus escaped, but on further stroking movements to clear away the cortex, a second nucleus presented itself, and was removed. The operation was completed and nothing further worthy of note occurred. On examination, one nucleus, which he took to be the anterior one, was exactly of plano-convex shape, but the other was in the form of a positive meniscus with a small elevation at the center of the concave surface. Each nucleus measured 5*mm* in diameter, and was hard, and dark brown in color. The formation of the two nuclei had probably begun at an early age—probably before 25, that being the time at which a nucleus was recognizable, but, of course, sclerosis of the inner-central portion of the lens began much earlier.

Mr. GRAY CLEGG also read a commentary on a case of **death following open evisceration.** The patient, T. F., male, when aged 47, was struck on February 27, 1906, by a chipping of hot metal on the right eye. A few days later, he was admitted to the hospital suffering from an extensive ulcus serpens with hypopyon. Useful sight was destroyed, but the eye became quiet, with the formation of a dense leucoma, involving the whole of the front of the eye. Some years after, on October 2, 1913, he again attended at the hospital under his (Mr. Clegg's) care, with signs of early panophthalmitis, and four days later—*i.e.*, on October 6th, open evisceration was performed at his direction. On October 8th, the patient became rambling in his speech, and very restless. The temperature was 99° F., pulse regular, but the breathing was rapid; there were no physical signs of pneumonia. It was considered advisable to remove him to a general hospital where acute post-operative mania was diagnosed. He died the following day at 1.30 P.M. A post-mortem examination was made. There were no external signs of disease or injury except the eviscerated globe, which was half full of thick

gummy pus. There was no evidence of inflammation in the conjunctiva, cellular tissue of orbit, or lids. The surface of both cerebral hemispheres was intensely injected, and covered with a thin layer of greenish-yellow pus; these changes being marked on the frontal lobes. The optic nerve of the operated right side was considerably swollen, and showed many minute vessels on the surface. On cutting it across at the optic foramen a bead of pus exuded at once from the cut surface of the distal portion. There was no evidence that the pus had reached the brain through the sphenoidal tissue. The left optic nerve was normal. The whole of the base of the brain was bathed in thick pus; nothing abnormal was found inside the brain. There was no evidence of any ear disease, and the result of the examination was to show clearly that the infection had reached the meninges via the right optic nerve. In other respects the organs were those of a well-nourished healthy male. He had had since November, 1909, 33 cases of complete purulent panophthalmitis due to all causes; open evisceration had been adopted in all of them, and in 27 a small hard stump had resulted, but in 6 the recovery was complicated by sloughing of the sclera, which was noted at intervals varying from ten days to three weeks from the time of the operation. The operation for open evisceration for panophthalmitis had always been considered to be free from the risks incurred on enucleation.

Mr. MADDOX described the use of a traction thread passed through the insertion of the superior rectus muscle to facilitate the toilet of the iris in intracapsular extraction of the lens, and showed specimens of Colonel Smith's instruments which he had had made of the light metals, magnalium and aluminium. He also showed an improved form of his simpler pattern of axis finder for cylindrical lenses.

Mr. G. COATS reported a case in which, after a blow, the pigment epithelium and dilatator had disappeared from a sector-shaped area about 6*mm* broad in the temporal half of the iris. On external examination the iris stroma in this area appeared to be almost normal, but on illumination with the ophthalmoscope light was transmitted through the interstices. With the transilluminator the translucency of the sector was almost complete, the appearance of a coloboma covered with

a very delicate veil being simulated. Elsewhere the iris transmitted no light. Under a mydriatic the inner, upper, and lower parts of the iris retracted perfectly, but the outer remained quite flaccid, the edge of the pupil forming a straight vertical line, and remaining in its former position. The pigmented margin was absent in the outer half of the pupil; present elsewhere. The color of the irides was a moderately deep, greenish blue. Vision $\frac{6}{12}$, and J 1. No changes in the deeper parts of the eye. The condition was of great rarity, but had been described by Gelpke, Pohlenz, and Boerma, and was attributed either to driving back of the iris to such an extent as to produce an indirect rupture of its posterior, less elastic layers; to direct injury by a penetrating instrument thrust up between the iris and lens; or to rupture from behind, by levering or tilting forward of the lens against the posterior surface of the iris. The first of these seemed to be the most probable, the rupture resulting either from simple stretching, or from nipping of the iris between the cornea and lens. It had recently been asserted by Rubel that the imperviousness of the iris to light was chiefly a function of the iris stroma, the pigment epithelium being relatively of little importance. This case, on the contrary, showed that, when the pigment epithelium was absent in a lightly pigmented iris, the stroma presented scarcely any obstacle to the passage of the brilliant light of the transilluminator. The observation confirmed a statement by Fuchs that the depth of pigmentation in the epithelium was very variable, and that its amount was a most important factor in determinating the translucency or otherwise of the iris.

Mr. MAYOU, describing certain diseases in the eyes of animals, said that congenital malformations in dogs and cats were of comparatively frequent occurrence. He had seen all forms of persistent pupillary membrane adhesion between the iris and the cornea, pigmentation on the anterior capsule of the lens, anterior polar cataract, and congenital dislocation of the lens. More extensive congenital malformations were also frequently seen. Buphthalmos in dogs was not at all uncommon. The distention of the eye increased throughout the life of the animal, and sometimes the eye reached an enormous size, even three and four times the size of the natural eye of

the animal. He described the following cases of congenital malformation in the eye leading to buphthalmos:

(1) **Buphthalmos and aniridia in a spaniel.**

(2) **Buphthalmos with congenital adhesion of the lens to the cornea and atypical development of the vitreous in the eye of a Pekinese spaniel.**

(3) **Optic atrophy following intestinal hemorrhage in a Samoyede dog.**

(4) Case of **tuberculosis of the iris and choroid in a cat, which had also a tuberculous lesion of the mammary gland.**

(5) **Primary carcinoma of the ciliary body in a Pekinese spaniel.**

Dr. THOMSON HENDERSON read a paper on the **Post-operative complications of cataract extraction,** and after fully explaining his reasons said that the point he wished to make was that an adhesion of iris or capsule did not in itself lead to pathological results so long as these structures did not act, so to speak, as a bridge allowing the invading epithelial cells on the one hand, or the connective tissue cells of the subconjunctival tissue on the other, to swarm into the anterior chamber. Chance must here play an important rôle. Another pathological point to which he referred was the complications which might follow needling. Some years ago he had come into possession of an eye which had been needled and its examination explained matters. He found a new hyaloid had formed as a sort of condensation of the surface of the vitreous structure. This new hyaloid joined up and was cemented with the edges of the old hyaloid and of the posterior lens capsule. This case explained to him the cause of the glaucoma following needling in other cases which he had examined. The vitreous in these cases had, if one might use the expression, got spilt into the anterior chamber, and then, by a process of condensation and new hyaloid formation, it had attached the iris to the vitreous, or formed a similar formation at the angle, the pathological results of such being the same.

Dr. THOMSON HENDERSON read a paper on the **Clinical proof of the venous level of the intraocular pressure and a method of estimating the arterial diastolic pressure in the eye and its clinical significance.** He said that veins being elastic and not rigid tubes it was impossible for the intraocular pressure, as

was believed, to be greater than the venous pressure, for otherwise the veins at their point of exit would be constricted. The truth of this assumption could be put to clinical proof by anyone who was able to use an ophthalmoscope. All that was necessary was to observe the disk by the direct method and then very lightly touch the lid with the tip of the finger of the disengaged hand. The points of venous exit on the disk would then be seen to become constricted by this light pressure, though it was merely a light touch and nothing more. If, instead of producing the collapsing pulse by digital pressure, one used a pressure gauge such as Messrs. Weiss had made for him, one was able to obtain an exact index of the height that the arterial diastolic pressure was above the intraocular, or, what was the same thing, above venous exit pressure. The pressure necessary to produce the collapsing pulse was, in adults, between 15 and 25*mm* Hg. That showed that the arterial diastolic pressure was only 15 to 25*mm* Hg. above the intraocular or venous exit pressures. In school children the collapsing pulse was elicited by the application of a pressure between 10 and 15*mm* Hg. In brief, the principles of the clinical application of the pressure gauge for the determination of glaucoma were as follows: The diastolic arterial pressure was the same in both eyes and therefore if a pressure of 20*mm* Hg. produced a collapsing pulse in one eye, while a reading of only 12*mm* Hg. would produce the same result in the other, the difference of 8*mm* Hg. was due to an existing increase of pressure in the second eye. The use of the pressure gauge thus made it possible to register slight differences of pressure between the two eyes in all cases in which the disk was visible.

QUARTERLY REVIEW OF THE PROGRESS OF OPHTHALMOLOGY.

By H. KOELLNER, Berlin; W. KRAUSS, Marburg; R. KÜMMELL, Erlangen; W. LOEHLEIN, Greifswald; H. MEYER, Brandenburg; W. NICOLAI, Berlin; H. PAGENSTECHER, Strassburg; K. WESSELY, Würzburg; and M. WOLFRUM, Leipsic, with the Assistance of Drs. ALLING, New Haven; CALDERARO, Rome; CAUSÉ, Mayence; DANIS, Brussels; GILBERT, Munich; GROENHOLM, Helsingfors; v. POPPEN, St. Petersburg; TREUTLER, Dresden; and VISSER, Amsterdam.

FOURTH QUARTER, 1913.

Edited by MATTHIAS LANCKTON FOSTER, M. D., New Rochelle.

I.—GENERAL OPHTHALMIC LITERATURE.

See Book Reviews.

1. SCHANZ, F. **The mirror sight for firearms.** *Ophthalmology*, Oct., 1913.

Presbyopes have difficulty in rifle shooting because the back sight is too near the eye. SCHANZ (1, **The mirror sight for firearms**) affixes a mirror in place of the foresight, and the image of the backsight then appears to be as far in front of the foresight as the backsight is actually behind it and is easily seen without accommodation. ALLING.

II.—RELATIONS OF OPHTHALMIC TO GENERAL DISEASES (INCLUDING POISONS).

2. BERARD, SARGNON, and BESSIÈRE. **Clinical contribution to the subject of isolated total or partial paralysis of the oculomotorius as a complication of serious otitis and sinusitis.** *La clinique ophtalm.*, p. 698.

3. BOER, W. **Diseases of the hypophysis and eye symptoms, with a report of three cases.** *Klin. Monatsbl. f. Augenheilkunde*, Oct.-Nov., p. 553.

4. BUTLER, T. HARRISON. **"Struma" an important factor in diseases of the eye.** *British Medical Journal*, October 18, 1913.

5. FEJER, J. **Diagnosis and operative treatment of hypophyseal tumors.** *Klin. Monatsbl. f. Augenheilkunde*, December, p. 722.

6. GAILLARD and MASSON. **Actinomycosis of the sphenoid.** *Soc. méd. des hôpitaux*, October, 1913.

7. GREENWOOD, ALLEN. **Ocular vertigo.** *Jour. A. M. A.*, Sept. 27, 1913.

8. GUILLAIN. **Optic neuritis with retrobulbar inflammation in the course of a meningitis.** *Annales d'oculistique*, cl., p. 394.

9. HEINE, L. **Elevation of brain pressure in some eye diseases.** *Muenchener medizinische Wochenschrift*, p. 2441.

10. V. HIPPEL. **Unusually severe metastatic gonorrheal inflammation of the eyes.** *Klin. Monatsbl.* f. *Augenheilkunde*, December, 1913, p. 774.

11. IGERSHEIMER, JOSEPH. **Recent investigations dealing with inherited syphilis of the eye.** *Ophthalmoscope*, December, 1913.

12. JACOBS, M. **Aspirin amblyopia.** *Nederlandsch Tydschrift voor Geneeskunde*, 1913, ii., No. 10.

13. KNAPP, ARNOLD. **Ocular disturbances of hypophyseal disease.** *N. Y. State Journal of Medicine*, 1913, No. 9.

14. KNOCH. **A case of grave anæmia with focal symptoms in the brain.** *Berliner klinische Wochenschrift*, p. 2276.

15. DEL LAGO and ZANI. **Anatomical condition in a case of infantilismus due to a hypophyseal tumor.** *Annal. di Ottalm.*, 1913, No. 4.

16. MACWHINNIE, A. M. **The teeth and their relation to the eye.** *N. Y. Medical Journal*, October 18, 1913.

17. MOHR, M. and BECK, C. **Papillitis as an early symptom of congenital syphilis.** *Zeitschrift f. Augenheilkunde*, December, 1913, p. 495.

18. PARKER, W. R. **Postcataract-extraction delirium.** *Journal A. M. A.*, September 27, 1913.

19. PONT. **Visual trouble coming on during dental treatment and disappearing with extraction of the tooth.** *La clinique ophtalm.*, xix., p. 965.

20. SNELL, A. C. **Report of a case of cavernous-sinus thrombosis resulting from a small abscess in the skin of the temple.** *Transactions of the American Ophthalmological Society*, 1913.

21. STEPHENSON, SYDNEY. **Tuberculosis of the eye.** *Lancet*, Nov. 29, 1913.

22. STREIFF, J. **Concerning the ætiology of rheumatic diseases of the eye and the treatment of inflammations of the eye on the basis of "secondary tuberculosis."** *Klin. Monatsbl. f. Augenheilkunde*, October-November, p. 527.

23. TERRIEN and AUBINEAU. **Quinine amaurosis.** *Archives d'ophtalmologie*, xxxiii., p. 699.

24. WILDER, W. H. **Metastatic ophthalmia.** *Jour. A. M. A.*, Sept. 27, 1913.

25. WOLFF, R. **Areflexia of the cornea in organic nervous diseases.** *Archiv. f. Psychiatr.*, lii., No. 2.

26. WUERDEMANN, H. V. **Orbital and ocular neuralgia due to dental irritation.** *Ophthalmic Record*, November, 1913.

In a second paper on the elevation of the intracranial pressure in diseases of the eye, HEINE (9, **Elevation of brain pressure in some eye diseases**) discusses the question whether primary eye diseases are in position to increase the intracranial pressure. In twenty-five cases of external lesions of the cornea, ulcus serpens, traumatic infiltrate, and catarrhal ulcer, he found the pressure normal in fifteen, slightly increased in five, moderately increased in five. Subjective cerebral symptoms were present in only one case. He believes a connection between the corneal affection and the increase of intracranial pressure to be probable in the last ten cases because no other cause for meningeal irritation could be found and the pressure later became normal again. In twenty-eight cases of injury to the eye, perforating wounds and contusions, there was no increase of the lumbar pressure in twelve, a slight increase in ten, a moderate increase in six. As some very severe injuries were not accompanied by an increase of pressure, he concludes that the severity of the injury is not an unqualified guide to the height of the brain pressure. In some cases the increase of intracranial pressure lasted for weeks with headache and dizziness. He concludes that such different conditions in men otherwise healthy must be ascribed to complicating psychogenous causes, such as shock, fear, worry for the future, which naturally are more or less present.

WOLFF (25, **Areflexia of the cornea in organic nervous diseases**) gives in detail our present knowledge of the corneal reflex, its origin, localization in the central nervous system. and the significance of its absence. His principal subject is the question whether it is transmitted wholly in the nuclear and root region of the trigeminus and facialis, or involves the cortex. Of the pathological conditions in which areflexia of the cornea may perhaps be the sole symptom, he mentions peripheral injuries of the trigeminus, glaucoma, neuroparalytic keratitis, and intracranial lesions in the region of the root, which consist mainly of softenings and tumors, especially of the pons, multiple sclerosis, tabes, and syringomyelia. In tumors of the posterior fossa of the skull the areflexia is usually on the same side; cases in which it is crossed are exceptions, but they show that this symptom cannot serve alone to determine the side of lesion with certainty. It is also

not to be relied upon as positively indicating the posterior fossa. Its most probable explanation in connection with tumors of this region is that it is due to the direct effect of pressure upon the peripheral, perhaps sometimes on the central, part of the trigeminus tract. Often it is the first clinical symptom of a commencing lesion of the trigeminus. That the sensitiveness of the cornea suffers first of all indicates that those fibres of the trigeminus are particularly sensitive, and may also point to peculiarities in the course of the nerve over the bone, as otherwise it would be associated with a greatly increased intracranial pressure in all cases, to which is opposed the fact that sometimes the areflexia appears later than other trigeminal disturbances. The cases of areflexia in hemiplegia depend on a loss of function from direct interruption of a central tract and it therefore appears on the opposite side to the lesion. It is very common, but not always associated with hemianæsthesia; it may be present with intact sensibility.

STREIFF (22, **Ætiology and treatment of rheumatic diseases of the eye**) warns against ascribing too much importance to the condition of the blood in these conditions, for many observers have been able to demonstrate tubercle bacilli in the circulating blood in almost all cases in which there was no history or clinical signs of present or past tuberculosis, and the tuberculin test was negative. Just as in the past we were too often satisfied with the assumption of a rheumatic basis, so to-day we must have a care not to mistake rheumatic diseases for tuberculosis. We must not content ourselves with antituberculous treatment in all cases of rheumatic disease of doubtless secondary tuberculous basis, but occasionally an energetic antirheumatic treatment should be instituted, even in cases of secondary tuberculous disease without rheumatic history. He reports two cases as examples. In both the tuberculous basis of a grave iridocyclitis was established not only by the history, but by the tuberculin test, but intermittent treatment with salicylates brought about great improvement and a cure.

BUTLER (4, **Struma an important factor in diseases of the eye**) believes that attenuated tuberculosis or strumous disease of the eye is exceedingly common and is generally amenable to treatment with tuberculin. The presence of enlarged

tonsils and adenoids in children should be regarded as indicatting the probability of struma. GROUT.

STEPHENSON'S (21, **Tuberculosis of the eye**) article covers very thoroughly our knowledge of tuberculosis of the eye. The diagnosis and treatment by tuberculin are carefully gone into. GROUT.

IGERSHEIMER'S (11, **Inherited syphilis of the eye**) article, which deals with damage caused to eyes by inherited syphilis, principally in childhood, gives no general view of the present state of the subject, but discusses only the results of the author's personal experience with syphilitic infants. Examination of ten newborn babies of syphilitic mothers showed no syphilitic manifestations ocular or otherwise. This is to be explained by the fact that children only become infected in the last months of intrauterine life, and that those fetuses which are infected earlier either succumb to the infection before birth or soon afterward. Twenty-seven nurslings of the series showed general symptoms of syphilis; of these, twenty-one had pathological changes in the eye. The most frequent syphilitic affection of the eye in babyhood is peripheric choroidoretinitis, the affections of the optic nerve being rare. Igersheimer believes that parenchymatous keratitis of the fetus and nurslings is purely a spirochætal infection, the changes being similar to those he has produced in animals. In adults, however, it is due to a liberation of endotoxic products, an anaphylaxis being produced.

GROUT.

MOHR and BECK (17, **Papillitis as an early symptom of congenital syphilis**) investigated the claim made by several recent authors that papillitis is a common early symptom of congenital syphilis, by the examination of 128 syphilitic infants ranging in age from one week to a year and a half. The ophthalmoscopic examination was made under homatropine in all cases, while the lids were held apart by an assistant. The frequently observed gray discoloration of the disk with sharply defined margins and slight swelling was always reckoned as doubtful. Sixty-two of the children had a distinct papillitis, in nineteen the condition was doubtful. In some cases the positive diagnosis of syphilis could be made from the ophthalmoscopic examination alone. The writers conclude

from their observation that papillitis is a valuable early symptom of congenital syphilis.

BOER (3, **Diseases of the hypophysis and eye symptoms**) describes three cases. In two there were corpulence and imperfect development of the genitals; one had homonymous hemianopsia with commencing optic atrophy, slight nystagmus and later double choked disk; the other had no loss of the field but vision was reduced to counting fingers at 1½ meters, the papillæ were a little pale, their margins indistinct; the pupils were dilated and reacted badly; intermittent nystagmus also was present. The Roentgenological examination confirmed the diagnosis, at least in the first case, in which the entrance of the sella was much enlarged, the dorsum shortened and thinned. In the third case the most striking symptom was a marked hypergenitalism. Bilateral optic atrophy and nystagmus were present. The X-ray showed a deep excavation of the sella turcica and shortening of its dorsum. The hypergenitalism indicated disease of the pineal gland. There were two possible explanations in this case: either a tumor starting in the region of the hypophysis had grown toward and compressed the pineal gland, or the primary seat of the tumor was the pineal gland and through hydrocephalus it had pressed upon and destroyed the sella.

KNAPP (13, **Ocular disturbances of hypophyseal disease**) says that increase in size of the diseased hypophysis causes pressure on the optic chiasm, owing to the close anatomical relationship, with resulting disturbances in the visual field. The most frequent of these is a temporal hemianopsia, which is not symmetrical and is present in about half of the cases. Scotomata, if present, usually precede the hemianopsia. Simple optic atrophy has been noted in about twenty per cent. of the cases and choked disk is about half as frequent. Ocular paralyses are present in ten per cent. of the cases, the oculomotorius being the most frequently involved.

GROUT.

FEJER (5, **Diagnosis and operative treatment of hypophyseal tumors**) furnishes another contribution to this subject. His patient developed normally up to the fourteenth year, when he ceased to grow. At seventeen his vision began to fail, with headache and vomiting at first. At twenty-one his left eye

was amaurotic, his right had temporal hemianopsia and contraction of the nasal half of the field; both papillæ atrophic. The X-ray showed an enormous excavation of the sella turcica. In other respects the patient had general infantilism, infantile sexual organs, cryptorchism, and absence of the cremaster reflex. Operation revealed a cystic degeneration of the hypophysis, which was evacuated and the masses of detritus removed. Recovery was uneventful. Vision improved a little in the course of a few months. No influence was produced by the operation on the general condition. No deterioration had been observed at the end of a year and a half.

In a man 26 years old, with a tumor of the hypophysis that had been growing for twelve years, DEL LAGO and ZANI (15, **Infantilism due to a hypophyseal tumor**) found general weakness, dizziness, somnolence, vomiting, blindness of the right eye, temporal heminanopsia of the left. Radiography of the skull showed a considerable excavation of the sella turcica. Operation hastened death. At the autopsy was found a cyst as large as a nut, which protruded from the sella turcica, pressing back the chiasm. The cyst contained a yellowish fluid and had histologically the character of a cholesteatomatous cyst. CALDERARO.

MACWHINNIE (16, **The teeth and their relation to the eye**) reports two cases of abscess of the root of the tooth, which upon being evacuated afforded relief to the patients, who had previously complained of pain and vague asthenopic symptoms. GROUT.

WUERDEMANN (26, **Orbital and ocular neuralgia due to dental irritation**) cured a case of severe neuralgic pain back of the eyeball by having a sensitive molar tooth extracted. A dental spud was found protruding from the posterior root for about a sixteenth of an inch. ALLING.

PONT (19, **Visual trouble coming on during dental treatment and disappearing with extraction of the tooth**) observed a sudden disturbance of vision in a woman 52 years old, who was undergoing dental treatment of the root of the right lateral upper incisor, that passed away as soon as the root was removed. The cause was probably a perforation of the alveolar ligament by an instrument at a previous treatment of the tooth. CAUSÉ.

The first case reported by WILDER (24, **Metastatic ophthalmia**) was a patient in a pyæmic condition, and staphylococci were found in the blood. Both eyes became blind. The vitreous chambers were full of opacities and one eye showed hypopyon. Later the eyes began to clear, but the patient died twelve days after the infection of the eyes. The second case, after a severe tonsillitis and suppurative otitis, developed inflammatory signs in one eye with dense clouds in the vitreous. The active symptoms gradually subsided, but the eyeball was shrunken. The third case a few days after an attack of diphtheria noticed dimness of vision in both eyes, which later increased to perception of light only. Both eyes were congested and painful. There was a pupillary exudate, and a cloudy vitreous. Both eyes returned to normal under treatment. Whether the infection in this case was due to diphtheria, or to staphylococci which were found in the throat, is doubtful.

ALLING.

VON HIPPEL (10, **Unusually severe metastatic gonorrheal inflammation of the eyes**) saw a case in which a joint disease and bilateral metastatic conjunctivitis and iritis with a thick gray yellow exudate, set in. After a few days masses of exudate appeared in the vitreous. Six weeks from the beginning there was a bilateral severe papillitis and cloudiness of the retina with a large, central, absolute scotoma. Later there was a development of cataract in the posterior cortex of the lens. After retrogression the tissue of the iris proved to be atrophic, and the pupils to be dilated almost to the maximum as the result of synechiæ that had formed while under atropine mydriasis. Ten months later the scotoma had become smaller, though still absolute. Vision was $\frac{1}{15}$ and $\frac{1}{60}$. The articular disease recovered under antigonorrheal treatment, but no influence could be perceived in the affection of the eyes.

GAILLARD and MASSON (6, **Actinomycosis of the sphenoid**) observed an actinomycosis of the sphenoid in a man 20 years old, who complained first of headache with tenderness of the branches of the trigeminus. The diagnosis was first made at the autopsy. At the beginning of the treatment, which was mercurial in spite of a negative Wassermann, there was simply a paresis of the right abducens; gradually vomiting and obstinate obstipation were added. Later the movements of

the eyes were limited greatly in all directions, and then total blindness supervened, with no sign in the fundus to explain it. The patient died three months after the beginning of his illness. Autopsy revealed an empyema of the sphenoid, complete destruction of the hypophysis, and thickening of the sella turcica. Microscopically the diagnosis was made of actinomycosis. CAUSÉ.

BERARD, SARGNON, and BESSIÈRE (2, **Isolated paralysis of the oculomotorius in otitis and sinusitis**) say that isolated paresis of the abducens is common as the result of an abscess at the apex of the petrous bone, or as a reflex symptom; it is a benign indication. The authors observed two cases of chronic purulent otitis with caries of the petrous portion of the temporal bone. The first was a case of cholesteatoma which involved the entire petrous portion of the temporal bone and led to an extensive suppuration. There was a paresis of all the muscles supplied by the oculomotorius. Death followed partial resection of the bone. At autopsy a fresh phlebitis was found in the lateral sinus, and extending forward from the apex of the bone on the outer surface of the cavernous sinus was an abscess with a hæmatoma. The position of this abscess explained very well the onset of motor-oculi paresis with an intact abducens. The second case was like the first, but came neither to operation nor to autopsy because death ensued very quickly. The authors also saw a case of motor-oculi paresis with empyema of the ethmoid, sphenoid, and frontal sinus after grippe, the cause of which was ascribed to the condition of the cavernous sinus because of the anatomical position of the nerve on the wall of the sphenoid. Partial paresis gives a good prognosis, total paresis a bad one. The process may recover without operative intervention, but the latter is to be recommended. CAUSÉ.

SNELL'S (20, **Cavernous sinus thrombosis**) case was typical. There was improvement under streptococcic vaccine injections, but the final result was fatal. ALLING.

GUILLAIN (8, **Optic neuritis with retrobulbar inflammation in the course of a meningitis**) reports a retrobulbar neuritis with meningeal disease in a man 18 years old. The only other symptoms were increased reflexes, obstipation, headache, and, at lumbar puncture, considerable lymphocytosis without hy-

pertension. Later transient disturbances of vision appeared and nystagmic twitchings; no fever was present at any time. The ætiology of the case was absolutely unknown. Syphilis, tuberculosis, diseases of the ear, nose, and accessory sinuses were excluded with certainty, gonococcus infection, with probability. Recovery took place in the course of six weeks.

CAUSÉ.

KNOCH (14, **Anæmia with focal brain symptoms**) describes the case of a soldier who had often suffered from pain in the stomach and was finally admitted to the hospital for fever and hæmatemesis. The blood contained 30% of hæmoglobin, 3,800,000 erythrocytes, 9500 leucocytes, to the cubic millimeter. A month later cerebral symptoms set in; inhibition of the power of thought, aphasia with paraphasia, alexia, agraphia, slight apraxia, and distinct perseverance. Two months later speech had improved, but a right-sided ptosis and homonymous hemianopsia had developed. The hæmoglobin at this time was 60% to 70%. Eight weeks later speech and memory were good, but agraphia and alexia persisted. The right homonymous hemianopsia was now complete, without a hemianopic reaction of the pupil. As the light reflex of the pupil was intact, the lesion responsible for the hemianopsia must have been situated above the optic tract, and, from the accompanying symptoms of aphasia and alexia, may be located with the greatest probability in the cortex. As the patient likewise presented increased reflexes, we must suppose that the lesion was between the cortex of the one side and the anterior cornu of the other. It may have been in the medulla of the occipital lobe, extending into the cortex of the left temporal, and perhaps to the lower frontal lobe. From the course of the disease the cause is to be sought in the profound anæmia; either thrombosis or insufficient nutrition of the brain led to softening. The prognosis for recovery appears to be very doubtful.

GREENWOOD (7, **Ocular vertigo**) reports nineteen cases which came to him for the relief of vertigo. Out of this number there were seventeen having astigmatism with one or both axes oblique. In all of these cases the correction of the refractive error seemed to relieve the vertigo, although in some instances the lens was no stronger than 0.25 D. He thinks

that muscular errors are not often the cause of this symptom.
ALLING.

PARKER (18, **Postcataract-extraction delirium**) relates eleven cases of this postoperative psychosis. The delirium occurred in 0.29% of the cataract extractions in the Ophthalmic Clinic of the University of Michigan during the past five years. No patient showed signs of mental disturbance before, during, or after the operation. The urine was free from sugar, albumin or casts in nine cases, with no examination in two. The disturbance did not occur in a single case until at least twenty-four hours after operation and therefore could not have been due to cocaine. There was no rise of temperature.
ALLING.

JACOBS (12, **Aspirin amblyopia**) reports a case of monolateral amblyopia with normal fundus in a girl who had taken two tablets of aspirin a day for three days and three tablets for two days. The vision fell to $\frac{5}{60}$, but returned within two days to $\frac{5}{4}$.
B. P. VISSER.

TERRIEN and AUBINEAU (23, **Quinine amaurosis**) saw amaurosis set in in a woman 46 years old after a single dose of 7.5*gm* of quinine sulphate. The primary threatening symptoms retrograded within twenty-four hours, and hearing returned, but the vision was so impaired that the patient could not go about alone, and it gradually grew worse to almost total blindness in spite of treatment with potassic iodide and injections of strychnine. At the first examination there was an extensive yellowish gray opacity of the retina with extreme contraction of the vessels. The arteries and the veins could not be distinguished apart. Gradually an œdema appeared in the macula, especially in the worse affected right eye. An atrophic patch appeared here, which like the papilla finally gave the appearance of neuritic atrophy with almost complete sclerosis of the retinal vessels. There was a high degree of contraction of the visual field and a complete loss of the color sense. The contraction of the vessels, which is always present in bad cases, plays an important part in the pathogenesis of quinine amaurosis, in addition to the direct action on the nerve fibers and ganglion cells.
CAUSÉ.

III.—GENERAL AND EXPERIMENTAL PATHOLOGY AND TREATMENT.

27. MacEnri. **Idiosyncrasy of the eye to atropine.** *La clinique ophtalm.*, xix., p. 697.

28. Von Reuss. **My method of electrical treatment of inflammatory diseases of the eye.** *Wiener medizinische Wochenschrift*, No. 39.

29. Waldmann. **Diathermia in ophthalmology.** *Ninth Annual Meeting of the Hungarian Ophthalmological Society in Budapest.*

Waldmann (29, **Diathermia**) claims that diathermia is a valuable therapeutic aid in various chronic inflammatory diseases of the eye, particularly iridocyclitis and interstitial keratitis. It is demonstrable that the temperature of the interior of the eye can be raised considerably in this way, from one to one and a half degrees, which cannot be done with hot compresses or thermophores. Von Liebermann.

Von Reuss (28, **Electrical treatment of inflammatory diseases of the eye**) usually employs prolonged faradization. This gives good service in relieving the pain in iritis and iridocyclitis, and also seems to shorten the attack through the promotion of absorption, and to have a protective effect against recurrences. He uses it for its anodyne effect in all forms of keratitis, even in eczematous kerato-conjunctivitis associated with photophobia and pain. In scleritis he uses the galvanic current, placing the kathode upon the scleritic lesion after previous cocainization. This produces a hyperæmia and obviates the pain in one or two sittings. He obtained particularly good results from the use of the faradic current in episcleritis periodica fugax. Furthermore, he was successful in relieving several cases of erythropsia with electricity.

MacEnri (27, **Idiosyncrasy of the eye to atropine**) reports a case in which two drops of atropine instilled into the eye of a man suffering from chronic iritis caused severe pain, marked chemosis, and great redness of both the eye and its vicinity that looked like erysipelas. Recovery in four days under warm boric-acid compresses. Causé.

IV.—METHODS OF RESEARCH, REMEDIES, INSTRUMENTS, AND GENERAL OPERATIVE TECHNIQUE.

30. Danis. **Three operations on the eye and face performed under regional anæsthesia.** *La clinique ophtalm.*, xix., p. 566.

31. LANCASTER, W. B. **Posterior ocular illuminator.** *Transactions, American Ophthalmological Society*, 1913.

32. SHAHAN, W. E. **Equivalent values in spectacle lenses.** *Journal A. M. A.*, September, 27, 1913.

In DANIS's first case, one of epithelioma of the left cheek and ectropion, a 1% solution of novocain and suprarenin was injected directly into the Gasserian ganglion, according to Haertel's technique, after which the operation was performed in perfect anæsthesia. In his second case a lacrimal sac was extirpated after injection into the nasal and supraorbital nerves; in his third a spastic entropion was corrected after injection into the supraorbital. He ascribes the absence of any annoying deformation or secondary hemorrhages to the lack of local infiltration. CAUSÉ.

LANCASTER (31, **Posterior ocular illuminator**) has devised a small electric lamp on the end of a flexible tube which may be passed to the back of the eyeball through an incision in the conjunctiva and Tenon's capsule. He thinks that it might be used in desperate cases when posterior transillumination would serve to clear up a diagnosis. ALLING.

SHAHAN (32, **Equivalent values in spectacle lenses**) states that a lens of 10 D strength when ground in meniscus form, *i. e.*, + 20 D on one side and — 10 D on the other, would be equivalent to + 12 D in the biconvex form. Further, the usual neutralization tests will not show this increase in strength. Hence the discrepancy between the effect of the test case lenses and the glasses ground according to the prescription is of considerable importance, especially when the toric form is employed. ALLING.

V.—ANATOMY, EMBRYOLOGY, MALFORMATIONS.

33. HESSER, KARL. **The normal connective tissue and smooth muscles of the human orbit.** *Anat. Hefte*, 1913, p. 147.

34. LUEDDE, W. H. **A microscopical study of the conjunctival vessels.** *American Journal of Ophthalmology*, May, 1913.

35. MAGITOT and MAWAS. **The vitreous cells of the human eye (their origin, signification, and physiological rôle in the formation of the intraocular fluid).** *Annales d'oculistique*, cl., p. 323.

36. POTTS, J. B. **Some comparative measurements of the skull and the sella turcica.** *Journal A. M. A.*, September 27, 1913.

37. WIEGMANN, E. **A peculiar condition of the iris: congenital division into two layers.** *Klin. Monatsbl. f. Augenheilkunde*, December, 1913, p. 697.

LUEDDE (34, **Microscopic study of conjunctival vessels**) has made a large number of observations of the conjunctival vessels. He uses the Zeiss binocular microscope and has studied especially the evidences of sclerosis, such as aneurysms, varicosities, and irregular tortuosities. The examination of 625 soldiers disclosed the fact that 22.2% showed positive findings of this sort. Among syphilitics he found in this way evidences of early vascular disease in many cases. He thinks that the changes which can be demonstrated in the conjunctival vessels make it possible to discover sclerotic process at a very early period, when the general findings are not yet positive. ALLING.

LANDSTROEM reported in 1907 that he had discovered a smooth muscle that surrounded the anterior portion of the eyeball and was able to change the position of the globe by its contraction. He explained the exophthalmos of exophthalmic goitre through the action of this muscle. Fruend and Krauss took exception to these statements. Fruend claimed that Landstroem's muscle was simply a part of Mueller's lid muscle. Both referred the exophthalmos of exophthalmic goitre to the smooth muscles that fill the inferior orbital fissure, the contraction of which compresses the superior and inferior ophthalmic veins with the result of producing an engorgement of the orbital veins and a consequent exophthalmos. HESSER'S (33, **Normal connective tissue and smooth muscles of the orbit**) researches show that a smooth muscle is present that corresponds approximately with the anatomical conditions given by Landstroem. But he denies that this muscle can produce exophthalmos, and he also denies that the orbital muscle can compress the ophthalmic veins by its contraction and so bring about an engorgement in the venous system. It was only in exceptional cases that he found the anatomical conditions such that one or other of these veins could be compressed by the contraction, and he particularly denies that an exophthalmos can be produced in this way. The anastomoses of the veins of the orbit with many of the face would obviate the questionable engorgement.

MAGITOT and MAWAS (35, **Vitreous cells of the human eye**) continuing their studies of the vitreous, deal in this paper with the cells. The vitreous is of ectodermal origin, its tissue neuroglial, and it is itself an integral constituent of the retina. In the primary vitreous are found together with the sparse vessel-forming-cells of mesodermal origin, neuroglia cells of characteristic form and protoplasm. They are short-lived, appear between the sixth and eighth weeks, and are no longer to be found in embryos 12*mm* long. In the transitory or neuroglia vitreous, these cells accompany the hyaloid artery in all its branches as a mantle composed of two later of only one layer. The proplasm thins itself into threadlike processes, which become fibrils in the free space of the vitreous in embryos of three months. Other parts of the protoplasm vacuolize and pour the contents of the vacuoles into the vitreous. These neuroglia cells pass forward with the vessels to the anterior surface of the iris and take a considerable part in the formation of the aqueous, which is at first thick and albuminous, but later less coagulable, and is formed between the third and fifth months. Vitreous fluid and aqueous are therefore identical in fetal life and probably also later. The retina fills the entire space between the cornea and uvea with its glial tissue.

CAUSÉ.

POTTS (36, **Some comparative measurements of the skull and the sella turcica**) has examined the X-ray plates taken in localizing foreign bodies in the eye with a view to determining the size of the normal sella turcica. The normal measurements vary from 8*mm* to 13*mm* antero-posteriorly, and from 6*mm* to 10*mm* in depth. There seems to be no relation between the size of the skull and that of the pituitary body. Another striking point is that in contradistinction to the frontal and sphenoidal sinuses, the sella turcica reaches a size equal to that of the adult at an early age, showing that the pituitary body is of vital importance to the development of the body. He presents histories of nine cases which gave more or less definite symptoms of pituitary enlargement. None of the cases came to operation.

ALLING.

WIEGMANN (37, **Peculiar condition of the iris**) describes a case in which the iris of both eyes was divided congenitally into two layers. The anterior layer was almost completely

separate from the subjacent one, connected with it only by a few threads, and did not move with the reaction of the pupil. He thinks that the anterior layer of stroma was detached from the rest of the iris during the retrogression of the pupillary membrane. This case seems to indicate that Muench was wrong in his contention that the stroma cells of the iris have a dilatator action.

VI.—NUTRITION AND INTRAOCULAR TENSION.

38. HAMBURGER. **The nutrition of the eye.** *Berl. ophthalm. Gesellsch.*, December 11, 1913.

39. ROEMER and KOCHMANN. **Experimental investigations concerning increase of intraocular tension.** *Ibid.*, December 11, 1913.

40. SCHOENBERG, M. J. **Experimental study of intraocular pressure and ocular drainage.** *Journal A. M. A.*, September 27, 1913.

41. VERDERARME. **The effect of subconjunctival injections of salt upon the tension of the human eye.** *Annali di Ottalm.*, 1913, No. 2.

HAMBURGER (38, **The nutrition of the eye**) presents again his views concerning the change of the intraocular fluid. According to the filtration theory there is in the eye a slow current which starts from the ciliary body, flows through the pupil into the anterior chamber and empties, into Schlemm's canal, thus acting the reverse of every other current, which is small at its source, gradually broadens, and is broadest at its mouth. Three grounds are given as evidence that the ciliary body is the source of the nutritive current, all three of which are incorrect: (1) Its vascular construction. It is not constructed on the principle of the secreting glands, but on that of erectile tissue. It is rich in veins and has few or no capillaries. (2) Its embryology. The anterior chamber is first formed when, after tearing away of the pupillary membrane, the secretion of the ciliary body can pass through, but he contradicts this with a section of an embryonal eye showing an intact pupillary membrane and a developed anterior chamber. (3) The ciliary body must be the nutritive organ, because the eye can do without the iris, but not without it. To disprove this, pictures were exhibited of eyes of fishes and lizards that had not even a rudiment of ciliary body. Against the theory that the ciliary body is the source of a constant current, he maintains that in every case in which secretion was obtained from it, the secretion was totally different from the physiological, and that it is

not inoculable by diffusible substances. He showed eyeballs which he had frozen after subcutaneous injection of fluorescin and assorcin, and then cut. The ice in the anterior chamber was stained, that in the posterior chamber and in the ciliary body was not stained. The ciliary body cannot be said to be the source of a measurable intraocular current, and its secretion must be less than that of the iris. ADAM.

In a series of investigations on twenty-four healthy eyes, VERDERARME (41, **Effect of subconjunctival injections of salt upon the tension of the human eye**) showed that subconjunctival injections of a two or three per cent. solution of salt caused an increase of tension which fluctuated between 2 and 7*mm* of mercury, and that the onset was the more distinct the greater the quantity and the concentration of the solution. The rise in tension took place about an hour after the injection, reached its maximum after from two to four hours, and disappeared after eight hours. Repeated injections may not produce the effect because of a certain habituation of the eye. Another series of investigations dealt with the effect of subconjunctival injections of a three per cent. solution of salt upon the tension of hypertonic and hypotonic eyes, which was an increase that disappeared within twenty-four hours.

CALDERARO.

ROEMER and KOCHMANN (39, **Experimental investigations concerning increase of intraocular tension**) still leave the occurrence of a rise in tension after subconjunctival injections of salt solution unexplained. In experiments in which the blood pressure and the intraocular pressure were graphically recorded, it was shown that the tension rose after subconjunctival injections of distilled water. Furthermore the rise may be materially influenced by the various methods of local anæsthesia of the eye, and even suppressed. The question is not one simply of a reflex action. The intraocular rise of tension from this cause is not influenced at all by ether anæsthesia, while it does not take place in chloroform anæsthesia, though it is not lowered. Experiments with amyl nitrite go to show that the tension of the eye rises with the sinking of the general blood-pressure.

ADAM.

SCHOENBERG (40, **Experimental study of intraocular pressure**

and ocular drainage) summarizes his paper as follows: (1) There is always a gradual reduction of intraocular pressure if the tonometer is applied on the normal eye for a certain number of seconds. (2) The rate of reduction varies not only in various eyes, but also in the same eye if taken at different periods. (3) Experimental evidence seems to show that changes of pressure in one eye may be followed by similar changes in the other. (4) There is no experimental evidence of the existence of a reflex or biochemical action starting from some distant region and influencing the intraocular pressure. (5) The reduction in the rate of ocular drainage under pressure on the eyeball may mean that the eye is threatened with glaucoma in spite of the fact that the actual readings are within normal limits. The essence of glaucoma is not high intraocular pressure, but rather the underlying conditions which lead to it.

ALLING.

VII.—THE SENSE OF SIGHT.

42. ANGELUCCI. **Phenomena of oxidation of the brain during vision.** *Archiv d'ophtalmologie*, xxxiii., p. 657.

43. ASCHER. **The influence of accommodation and convergence upon the localization of depth and the apparent size of objects.** *Zeitschrift f. Biologie*, lxii., p. 508.

44. AUGSTEIN. **Observations concerning the learning to see after a successful operation on a congenitally blind boy 15 years old.** *Klin. Monatsbl. f. Augenheilkunde*, p. 521.

45. HELMBOLD. **Testing of the color sense with pigments.** *Archiv f. Augenheilkunde*, lxxv., p. 381.

46. LOHMANN. **Red-green blindness observed after snow-blindness, and an experimentally produced disturbance of the color sense.** *Ibid.*, p. 214.

47. SCHIOETZ. **The use of dioptries in simple and complex optical systems. The coefficients of refraction of the media of the eye.** *Ibid.*, lxxv., p. 321.

48. TRENDELENBURG. **Experiments concerning the binocular mixture of spectral colors.** *Zeitschrift f. Sinnesphysiol.*, xlviii., p. 199.

SCHIOETZ (47, **Coefficients of refraction**) finds the coefficient of the aqueous to be rather less than usually given, 1.33495. The lowest coefficient is that of the vitreous, as obtained from thirteen different eyes, 1.33544. In some pathological conditions, such as glaucoma and iridocyclitis, the index of refraction was higher, and the refraction therefore lower unless

prevented by other causes. The indices of the cornea, the only double refracting medium, were 1.3682 and 1.4216. That of the lens he makes less than most authors, 1.4102; Tscherning makes it 1.42, Helmholtz 1.4519 and 1.4414, Krause 1.4541, and Listing 1.4545. He found no marked difference between the lenses of young and old persons.

ANGELUCCI (42, **Oxidation in the brain during vision**) exposed two animals adapted to the dark for an hour to white, or monochromatic light, and then investigated the brains of both for oxidation ability by the Roehmann-Spitzer reaction. This corresponds to the law of retinal oxydasis, but is very variable in different kinds of animals. It is most marked in the lower vertebrates, is less in birds, presents only traces in the lower mammals, and is entirely absent in the higher classes. Differences in retinal and cerebral oxydasis produced by light and dark are wholly wanting in rabbits. The phenomena of retinal and cerebral oxydasis appear to have a certain direct connection with the distribution of the visual red and the contraction of the retinal elements, yet an increase in them was found in the retinæ of turtles, which have no visual purple, under the influence of light. Cerebral oxydasis is logically a consequence of the processes in the retina under the influence of light. The more complex organization of the retinæ of mammals prevents in some unknown way the appearance of the phenomenon. CAUSÉ.

TRENDELENBURG (48, **Binocular mixture of spectral colors**) says that the necessary part of the short-waved components is much less in binocular than in monocular differentiation of colors.

HELMBOLD (45, **Testing of the color sense**) has constructed a new apparatus for testing the color sense, which permits the comparison of two pigment spots. Two rotable disks 18*cm* in diameter carry concentrically to their margins small colored round spots 3*mm* apart, so as to allow fifty-eight changes of color seen through two openings. One disk is placed so that a certain color is visible through one opening, and the patient is told to rotate the other disk until a color that appears the same to him appears in the other opening.

An interesting case of disturbance of the color sense after

snow-blindness, like that recorded by Best and Haenel in 1907, is reported by LOHMANN (46, **Red-green blindness observed after snow-blindness**). On the morning after a mountain climbing the patient complained that red objects looked brown. The disturbance of the color sense, tested with pigments and colored glasses, corresponded to that of progressive red-green blindness. Visual acuteness was normal. Normal color sense returned gradually in the course of several weeks. No reduction of adaptation was demonstrable.

AUGSTEIN'S (44, **Learning to see after a successful operation**) observations coincide perfectly with those of other authors. At first all objects could be distinguished only by touch. Recognition of objects and the beginning of certainty in going about commenced in the fourth or fifth week. In the fifth and sixth weeks the hitherto tube-shaped visual field broadened. The twitchings of the eye lessened and central fixation appeared. After about eight weeks the twitchings of the eye had ceased, but constant fixation was still impossible. About this time improvement of the vision could be obtained with the correcting glass. Then the vision improved within a few days. Augstein distinguishes three periods in the development: (1) Absence of perception in the retina, a condition continuing from the former blindness; (2) sufficient perceptive power of the retina to permit of the onset of central fixation; (3) enlargement of the visual field, habituation to reflex movements, rapid improvement of vision after correction. He concludes that, in addition to the cerebral processes that alone have been considered heretofore, the retina is at first incompetent to take pictures of the outer world in a way that can be utilized by the tracts of conduction.

ASCHER (43, **Influence of accommodation and convergence upon the apparent size of objects**) states that the apparent size of large objects situated more than a meter away depends wholly on the size of the retinal image. Differences of distance of the object which require a change of accommodation of less than $\frac{3}{4}$ of a diopter have no influence on the apparent size. When the object is brought nearer to the eye, irregularities appear in the experiment that suggest the action of an empirical factor dependent on the absolute distance of the object.

VIII.—ACCOMMODATION AND REFRACTION.

49. DISTLER. **Extraction in high myopia.** *Wuertt. med. Korrespond*, 1913.

50. LOEWENSTEIN. **Correction of monolateral aphakia with v. Rohr's anisometropic glasses.** *Zeitschrift f. ophthalm. Optik*, i., p. 97.

51. VON IMRE, J., Sen. **The fate of anisometropic eyes.** *Ninth Annual Meeting of the Hungarian Ophthalmological Society in Budapest.*

DISTLER (49, **Extraction in high myopia**) reports thirty-six extractions for high myopia in twenty-eight patients. He observed loss of vitreous in four, post-operative hemorrhages in nine, of which three were very bad, increase of tension with a good result in three, detachment of the retina in one, possibly as a consequence of discission, but more probably of the myopia itself. The vision secured was $\frac{1}{2}$ or better in nine, $\frac{1}{3}$ in seven, $\frac{1}{4}$ in fourteen, and less than $\frac{1}{10}$ in six. The impaired vision was to be ascribed almost without exception to the myopic changes present at the posterior pole.

VON IMRE (51, **The fate of anisometropic eyes**) claims that full correction is possible in the great majority of anisometropic eyes, and is of the greatest importance in the interest of binocular single vision and of the normal muscular balance. In many cases methodic exercises to develop binocular vision must be instituted. This opens up an important field for the activity of the school physician.

LOEWENSTEIN (50, **Correction of monolateral aphakia with v. Rohr's anisometropic glasses**) reports an excellent result from the use of these glasses in a man 23 years old. The patient had from the first no trouble with the correction and had with the anisometropic glasses good stereoscopic vision, although he did not have it when corrected with ordinary glasses.

IX.—THE MOTOR APPARATUS OF THE EYE.

52. KRAUPA. **Bell's phenomenon.** *Arch. f. Augenheilkunde*, lxxv., p. 361.

53. SAENGER. **Ophthalmic migraine. Ophthalmoplegia externa.** *Medical Society of Hamburg*, November 25, 1913.

54. ZENTMAYER, WILLIAM. **Report of a case of paralysis of divergence.** *Transactions of the American Ophthalmological Society*, 1913.

ZENTMAYER'S (54, **Paralysis of divergence**) patient had suffered from recurrent attacks of muscular paralysis with

diplopia. When examined he showed homonymous diplopia with marked convergent strabismus. The diplopia was progressively less as the object of fixation was brought nearer to the eyes and became crossed at 7*cm*. ALLING.

KRAUPA (52, **Bell's phenomenon**) reports a case of "perverse Bell's phenomenon," met with in a child who had a bad cicatricial ectropion of the upper lid due to caries of the bone. Bell's phenomenon was normal at first, *i. e.*, the eyes turned upward when the lids were closed. After an unsuccessful plastic operation the phenomenon changed so that a gentle attempt to close the lids caused the eyes to move downward. A forcible attempt to close the lids caused a slight excursion of both eyes upward, but they quickly turned back beneath the lower lid. Even in sleep the eyes were turned downwards. After another operation, which was successful, the phenomenon again became upward.

SAENGER (53, **Ophthalmic migraine. Ophthalmoplegia externa**) saw a paralysis of the motor oculi appear coincidently with a severe attack of pain. It was probably an attack of ophthalmic migraine, as the patient, who was 50 years old, had suffered from attacks of hemicrania since she was 15.

He also saw a bilateral ptosis appear in a boy 12 years old after an attack of scarlet fever, which disappeared and recurred several times, until, at the end of some months, an isolated ophthalmoplegia externa was present, a condition described by Moebius as due to infantile atrophy of the nucleus.

X.—LIDS.

55. BLASKOVICZ, L. **Kugel's operation.** *Ninth Meeting of the Hungarian Ophthalmological Society at Budapest.*

56. MAGGI, J. **Treatment of entropion and trichiasis.** *Annali di Ottalmologia*, 1913, No. 4.

57. OESTERREICHER, LUCIE. **White cilia.** *Prager med Wochenschr.*, No. 35.

58. SCOTT, LAMB. **Perithelioma of the eyelids.** *Ophthalmoscope*, p. 401.

OESTERREICHER (57, **White cilia**) reports four cases, in two of which the white discoloration of the cilia and eyebrows was caused by vitiligo. In one there were no changes in the skin referable to vitiligo. Both of the others were cases of trachomatous canities.

LAMB'S (58, **Perithelioma of the eyelids**) patient injured his eyelid with a nail. Two weeks later a swelling was noticed between the limbus and the outer canthus, not involving the lids. The little tumor was cut away but soon returned and the swelling now involved both lids. As no improvement followed conservative treatment, the tumor was excised, and found to be a spindle-celled sarcoma. While the tumor on the eyeball remained stationary for a long time, a neoplasm developed in the upper lid, investigation of which proved it to be a perithelioma. Exenteration was thereupon performed before the glands in the neighborhood became enlarged. The prognosis for life seems to be good. HOEHL.

BLASKOVICZ (55, **Kugel's operation**) has employed Kugel's operation of enucleation of the tarsus for senile ectropion in five cases, in some of them in combination with the shortening of the lid recommended by Kuhnt and Szymanowski, and is very much pleased with the result, especially of the combination. VON LIEBERMANN.

MAGGI (56, **Treatment of entropion and trichiasis**) recommends tarsectomy when the tarsus is much bent and moderate trichiasis is present. If further intervention proves to be necessary, he would make an intermarginal incision and fill it in with a graft of mucous membrane. All three of these procedures are necessary when the entropion and trichiasis are very marked. When the tarsus is degenerated, the two latter will suffice. CALDERARO.

XI.—LACRIMAL ORGANS.

59. LACOMPTE. **A case of double dacryops.** *Ann. d'ocul.*, cl., p. 276.

60. MOENNICH, P. D. **Concerning the occurrence of pneumococci in the conjunctival sac after conservative treatment of suppuration in the sac.** *Diss. Rostock*, 1913.

62. SNELL, A. C. **Report of a case of dacryocystitis presenting several complications including orbital abscess and optic neuritis.** *Ophthalmology*, October, 1913.

63. STOCK. **Anatomical examinations of extirpated lacrimal sacs.** *Klin. Monatsbl. f. Augenheilkunde*, December, 1913, p. 774.

LACOMPTE (59, **Double dacryops**) observed bilateral dacryops in two brothers, large enough in one of them to require extirpation. With regard to the pathogenesis he is inclined

to Goldzieher's theory that these are primary mucous cysts with a hereditary predisposition. CAUSÉ.

SNELL (62, **Dacryocystitis presenting several complications**) attempted to extirpate a sac which was surrounded by inflammatory infiltration and presented a fistulous opening through which pus was discharged in large quantities when backward pressure was made on the eyeball. A probe could be passed through the sac two and a half inches into the orbit. There was a slight optic neuritis and an engorgement of the retinal veins. Evidently a portion of the sac remained, for the discharge continued and a second operation was necessary to cure the case. He is inclined to think that the pressure which the patient was in the habit of making over the sac had resulted in rupture into the orbit and orbital abscess.

ALLING.

STOCK (63, **Extirpated lacrimal sacs**) found only six tuberculous cases out of 106 lacrimal sacs that had been extirpated. He believes that the reason why other observers have found a higher percentage is that they did not examine all of the sacs. Of the six tuberculous cases four were diagnosed as such before operation, in the other two there were no clinical signs of the disease. One was a case of dacryocystitis with ulcus serpens, the other a dacryocystitis in a woman 36 years old who had suffered from dacryocystitis as a child, but not when she grew older. In this last case the diagnosis was not quite positive; no tubercle bacilli were found and Wassermann's reaction was positive.

MOENNICH (60, **Pneumococci in the conjunctival sac after conservative treatment of dacryocystitis**) investigated the conjunctival sacs for pneumococci in 28 cases of dacryocystitis that had been treated conservatively by slitting the canaliculi and subsequent division of the stricture with a probe-pointed knife. The intervals between the treatment and the examination varied from a week and a half to eight years. Slides from thirty-five eyes showed pneumococci in six, 17%; cultures discovered them in 34%. This percentage is lower than that given by Mattice after extirpation.

(*To be Continued.*)

VI.—**Ophthalmic Surgery.** By Dr. CHARLES H. BEARD, Chicago. Second Edition, revised and enlarged, with 9 plates and 374 illustrations; pp. 745. Philadelphia: P. Blakiston's Son & Co., 1914. Price $5.00 net.

This new edition contains one-third more text, without increasing the size of the book. This in itself is noteworthy. Among the new matter introduced are chapters on the "Newer Operations for Glaucoma" and on the "Surgical Treatment of Detachment of the Retina." Furthermore, a description of a number of valuable surgical methods has been added, and the chapter on Cataract Extraction has been enlarged. The book has thus gained in completeness and contains all the newer operative procedures.

VII.—**Guide to the Microscopic Examination of the Eye.** By Professor R. GREEFF, Berlin. Translated by Hugh Walker, Glasgow. Pp. 86. Paul B. Hoeber, 69 East 59th Street, New York. Price $2.00 net.

This excellent book, which was recently reviewed in these ARCHIVES, March, 1914, is now published by Paul B. Hoeber, New York.

VIII.—**Disturbances of the Visual Functions.** By Professor W. LOHMANN, Munich. Translated by Angus MacNab, London. With 39 illustrations; pp. 185. Philadelphia: P. Blakiston's Son & Co., 1914. Price $3.50 net.

Professor Lohmann's book, *Die Störungen der Sehfunktion*, was favorably reviewed in these ARCHIVES, p. 112, vol. xlii., 1913. As it now appears in English it becomes accessible to a greater circle of readers, to whom it can be recommended, especially as it covers many features not usually dealt with

in textbooks. The translator is to be congratulated for the excellence of his work.

IX.—**Sclero-Corneal Trephining in the Operative Treatment of Glaucoma.** By Col. ROBERT HENRY ELLIOT, I. M. S. Second Edition; pp. 187. London: Geo. Pullman & Sons, 1914. Price

The great interest which the operation of trephining has aroused makes the appearance of a second edition, revised and enlarged, of Col. Elliot's well-known book unusually timely. The author has made use of his own enlarged experience with this operation, and of a careful study of the literature on this part of the glaucoma problem which has already grown to enormous proportions. The essential features of the author's technique are more definitely stated and the book has gained by becoming more rounded out. One must admire the author's fair-mindedness in the discussion of the many problems which are not yet solved, and his tolerance of many modifications which his method has been subjected to. The making of the book is not up to the usual English standard; the lines are unusually crowded together and the quality of the paper, presumably selected to bring out the illustrations, does not allow the blackness of the printing.

A. K.

MISCELLANEOUS NOTES.

Dr. EMIL GRUENING died of cerebral endarteritis on May 30th, aged seventy-two. Dr. GRUENING was identified with the development of ophthalmology and otology in this country, and was a frequent contributor to these ARCHIVES. An obituary notice will appear in the next number.

At a special meeting of the Board of Surgeons held on Monday, the first of June, 1914, the following resolution was adopted:

The Board of Surgeons of the New York Eye and Ear Infirmary record with profound sorrow the death of their colleague Dr. EMIL GRUENING, who had been a member of the Board of Surgeons for nearly thirty-five years, and at the time of his death was one of the Consulting Surgeons of the Infirmary.

Dr. GRUENING was esteemed and beloved by all who knew him, and his loss will be felt not only by the members of this Board, but by his many other friends and admirers. The Board of Surgeons desire to extend to his family their heartfelt sympathy.

GORHAM BACON, M.D.
EDWARD B. DENCH, M.D.
WALTER EYRE LAMBERT, M.D.
Committee of the Board of Surgeons.